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INJURIES OF THE ELBOW JOINT

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ELBOW INJURIES are not as common as injuries of the weight-bearing joints of the lower limb. Fractures involving the elbow region are, however, about the fourth commonest type of fracture. As a matter of interest, the following table is given (adapted from data of Wilson):

FRACTURE CASES MASSACHUSETTS GENERAL HOSPITAL 1923-30

REGION	TOTAL	% TOTAL
Lower End Radius	490	11
Metacarpals and Phalanges	481	11
Both Bones of Forearm (shaft)	440	10
Elbow	406	9
Bones of Leg (shaft)	346	8
Upper End of Humerus	245	5.5
Ankle	240	5.5

Movement of the elbow allows indulgence in many vocations and avocations involving the shoulder and augments the intricate movements of the hand and wrist. Injuries in this region are usually treated adequately and give excellent results but they are subject to serious complications which interfere with the restoration of function and the ability of a patient to earn a livelihood.

It is the purpose of this article, to provide the medical student with a concise account of the anatomical and clinical considerations of elbow joint injuries.

APPLIED ANATOMY OF THE ELBOW JOINT

When the fresh articular surfaces of the humerus, ulna and radius are examined and fitted together, the following observations can be made:

(*a*) The bony parts are in fullest and most stable articulation when the elbow is in a position of 110° to 170° of extension and half to three-quarters pronation. This position allows optimal contact of the head of the radius with the capitulum for transmission of force up the forearm. The greatest area of articular surface of the ulna including the lateral facet above the radial notch is in contact with the trochlea of the humerus. Thus, it may be concluded, the elbow is primarily designed to sustain the transmission of force up the forearm in this position.

(*b*) The articular portion of the lower end of the humerus lies in a plane at an angle of 135° with the shaft. Therefore, in most fractures of the lower end of the humerus, the flexed

position of the elbow is indicated for the maintenance of reduction.

(*c*) Most injuries occur to the elbow following a fall on the palm of the outstretched hand with the elbow slightly flexed and the wrist deviated towards the ulna. In this position, resistance forces are centered at the lower end of the humerus and result in either the typical supracondylar fracture of the humerus with posterior displacement or the usual posterior disclocation of the radius and ulna on the humerus.

(*d*) A fall on the pronated, radially deviated hand is poorly transmitted to the ulna by the slack interosseous ligament. Thus, great stress is placed on the humero-radial articulation with subsequent fracture of the head of the radius.

(*e*) The Brachialis inserts into the base rather than the apex of the coronoid process. Consequently, when this process is fractured it is seldom incorporated or attached to the tendon of the Brachialis and the fragment is usually but slightly displaced.

CLINICAL EXAMINATION OF THE ELBOW JOINT

The elbow should be gently examined by inspection and palpation, before X-ray is contemplated. Note:

(*a*) Deformity or irregularities of contour especially noticeable by comparison with the other elbow. The two humeral epicondyles and tip of the olecranon are normally in a line when the elbow is extended or form a triangle when the elbow is flexed.

(*b*) Signs of local trauma such as swelling, increased skin temperature or bruising.

(*c*) Distention of the joint or adjacent bursa due to accumulation of fluid.

(*d*) Preternatural mobility or hypermobility.

(*e*) Crepitus felt during tests of joint movement.

(*f*) Tenderness on pressure over the easily palpated epicondyles, olecranon and head of radius.

(*g*) Limitation or loss of joint movement due to pain, muscle spasm, joint effusion, inflammation, capsular or peri-articular adhesions. Test flexion, extension, pronation and supination (see fig. 1).

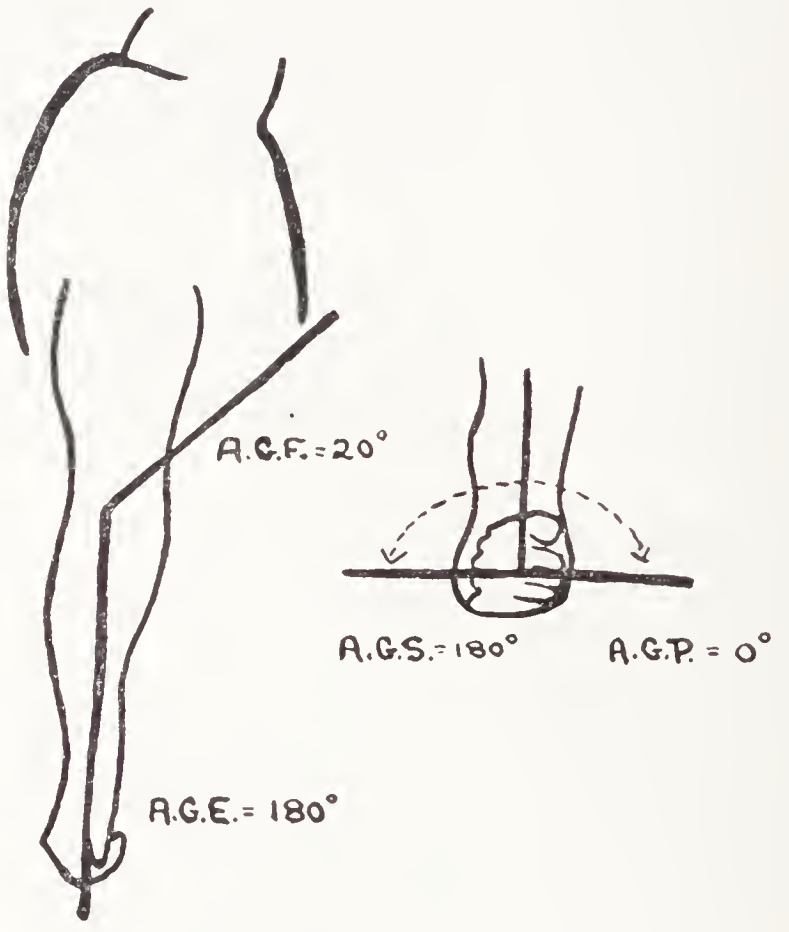

Fig. 1.—Movements of the Elbow Joint. A.G.E.: angle of greatest extension; A.G.F.: angle of greatest flexion; A.G.P.: angle of greatest pronation; A.G.S.: angle of greatest supination

(*h*) Pulsation in radial and ulnar arteries may be absent due to compresion of the brachial artery by bone or haemorrhage beneath the fascia.

(*i*) Integrity of the radial, ulnar and median nerves in the hand. The radial nerve may be tested by having the patient attempt to extend the wrist or thumb. To test the ulnar nerve have the patient attempt to abduct and adduct the fingers. To test the median nerve have the patient attempt to abduct the thumb.

X-rays of the elbow should always be taken in at least two views. Difficulty may be experienced in interpreting X-rays of children because the epiphyses are cartilaginous. By X-ray examination look for:

(*a*) Solution in the continuity of the bone indicating fracture.

(*b*) Irregularity of articular surfaces which may also indicate fracture.

(*c*) Relationship of the joint surfaces to discover subluxation or dislocation.

(*d*) Soft tissue swelling due to peri-articular thickening or fluid in the joint.

(*e*) Decalcification or sclerosis of bone.

(*f*) Areas of dead bone, tumour or cyst near the joint line.

(*g*) Calcified loose bodies in the joint.

(*h*) Bony exostosis or muscle calcification.

SPRAINS AND STRAINS OF THE ELBOW

Sprains essentially involve ligamentary parts of the joint capsule whereas strains involve immediately related muscular structures. Because the muscles of the forearm are intimately blended with the capsule of the elbow joint, injuries are likely to involve both muscle and ligament. Thus, differential diagnosis of sprain or strain is difficult, and from the standpoint of treatment, mostly academic.

The term "sprain" should be limited to the result of minor trauma such as rupture of a few ligamentary fibres; whereas, more severe injury, as evidenced by abnormal mobility of the joint, should be termed "torn ligaments."

The diagnosis of sprain is made by finding disability and a point of tenderness over the ligaments of the elbow after injury. This point of tenderness may be a small patch of effusion beneath periosteum or an area of ruptured fibres in a tendon or ligament. Extra- or intra-articular effusion commonly accompanies a sprain.

Elevation and support of the joint with cold applications for relief of pain and swelling followed by heat and active movement will give good results in treatment of an elbow sprain. A longer period of immobilization by splint should follow diagnosis of torn ligaments.

When a strain can be differentiated by finding point tenderness over muscle rather than ligament attachment, treatment is similar. It is with this type of injury that bone setters obtain dramatic results by forcible full movements of the affected muscle, apparently breaking down adhesions. Strain of the long head of the Biceps is designated "glass arm"; Pronator Teres, "Sculler's sprain"; extensors and supinators about the elbow, "angler's elbow".

TRAUMATIC SYNOVITIS OF THE ELBOW

This condition may accompany sprains, contusions, torn ligaments, or overuse of muscle about the elbow joint, especially in children. Watson-Jones, in 1929, reported 94 cases of traumatic synovitis of the elbow in a two-year period at the Liverpool Royal Infirmary. It was the commonest injury of the elbow joint, notably in the 11 to 20 year age group.

The joint is tender, movements are painful and there is muscle spasm. Some joint effusion is usually present. Treatment by rest in a sling for two weeks with the judicious use of heat and active exercise assures complete recovery.

BURSITIS OF THE ELBOW

The synovial membrane lining a bursal sac may become inflamed due to overuse or, possibly, secondary to a low grade infection in a distant focus. Any motion which causes the surfaces to rub together will cause pain. There will be marked tenderness to pressure over the affected bursa. A differentiation between acute and chronic bursitis may be made.

Olecranon Bursitis or Miner's Elbow. An inflammation or enlargement

of the olecranon bursa usually follows direct trauma to the area. Immediate aspiration plus compression bandage are advised by some surgeons. Others favour rest and the application of heat. Chronic olecranon bursitis will likely necessitate operative removal of the bursal lining.

Tennis Elbow or Golf Elbow. The aetiology of tennis elbow has been variously assumed to be, tearing of fibres of the Extensor Carpi Radialis Longus or Brevis from the lateral epicondyle, traumatic periostitis of the lateral condyle, tears of the lateral or annular ligament, inflammation of a humero-radial bursa or inflammation of a synovial fringe of the radio-humeral joint after trauma. Ogilvie and others favour the latter concept which classes this injury as an articular involvement of the nature of an internal derangement or traumatic synovitis. Mills reports finding a frayed synovial fringe in several operative cases.

The symptoms include the gradual onset of aching in the outer side of the elbow when certain movements are undertaken. At first, the pain ceases when the arm is at rest but eventually a feeling of soreness is constantly present. A momentary weakness on lifting small objects so that the object is dropped may also occur when the injury is established. Examination of the elbow reveals a definite localized tender spot over the lateral side of the humero-radial joint with pain in this region on clenching the hand.

Immobilization in a sling and application of external heat will cure the early dysfunction. Manipulation by pronation of the arm, flexion of the hand and wrist, and slow extension of the elbow with pressure over the lateral epicondyle is claimed to cure one-third of later cases. Surgical intervention with exposure of the capsule of the elbow joint and possibly, removal of the synovial fringe, is advised for cases resistant to the use of manipulation on several occasions.

DISLOCATIONS OF THE ELBOW JOINT

Dislocations of the elbow joint are usually rated as second in incidence to dislocations of the shoulder joint. Various complicated classifications have been used. The following classification includes only the most commonly occurring types:

Both bones of forearm:

(*a*) Backward.
(*b*) Forward.
(*c*) Medial.
(*d*) Lateral.

Radius alone:

(*a*) Anterior.
(*b*) Elongation or Subluxation.

Dislocations about the elbow are as common after 20 years of age as before this age. The commonest type is backward dislocation due to a fall on the pronated outstretched hand with hyperextension or slight flexion of the elbow. Wilson found 68 of 81 cases to be of this type with over two-thirds complicated by fractures of the medial epicondyle, head of the radius or coronoid process of the ulna, in that order. Forward or sidewise dislocation of both bones of the forearm are relatively rare.

Anterior dislocation of the radius due to a blow on the back of the upper end of the radius is often accompanied by fracture of the upper third of the shaft of the ulna (Monteggia fracture) (12 of 38 dislocations—Nelson). Subluxation of the head of the radius by elongation is known as "pulled elbow" and follows lifting or pulling young children by the hand.

Other complications of elbow dislocation are less common but quite serious, especially in old unreduced dislocations. Stripping of the periosteum near the Brachialis insertion may give rise to a subperiosteal haematoma which may ossify resulting in myositis ossificans traumatica. The ulnar nerve may be stretched or torn posteriorly. Median or radial nerve paralysis may follow stretching of tissues over the front of the joint.

In the usual posterior dislocation, diagnosis can be made by the characteristic deformity. The elbow is fixed at an angle of about 120° flexion with a prominent olecranon. There is a loss of the normal relationship of the olecranon to the epicondyles.

Manipulative reduction, under general anaesthesia is usually practised. To minimize additional damage to the joint violent traction or hyperextension are to be avoided because they increase the danger of periosteal stripping. Countertraction is applied to the upper arm and traction to the forearm in the axis in which it lies. Lateral or medial deviation is corrected as traction is begun. The arm is finally brought into flexion. A simple sling for three weeks, with beginning of unaided elbow movement at this time or slightly earlier, usually gives satisfactory results. Passive movements and massage are considered undesirable on account of the possibility of causing a myositis ossificans. If redisplacement due to fracture of the coronoid process is feared, a posterior plaster splint is well advised. Other complicating fractures should be treated as isolated injuries.

For recent or old anterior dislocation of the head of the radius, an open reduction and repair of the annular ligament with or without the use of fascia lata, is advised. Elongation of the radial head or "pulled elbow" is a partial dislocation with pain, inability to use the arm and prominence of the head of radius. Reduction by manipulation and retention in a sling for a few days usually suffice in treatment.

FRACTURES OF THE ELBOW JOINT

It has already been stated in the introduction that fractures about the elbow joint (see fig. 2) are fourth in incidence among all fractures. Utilizing Wilson's data a further breakdown of the group is useful in assessing this problem.

FRACTURES OF THE ELBOW, MASSACHUSETTS GENERAL HOSPITAL, 1923-30

REGION	TOTAL	% TOTAL
Supracondylar	83	20
Dislocation of the elbow	81	19
Head and neck of radius	78	18
Olecranon	48	11
Medial epicondyle	27	7
Intercondylar T type	26	6
Capitulum and epiphysis	22	5
Lateral condyle	17	4
Coronoid process	17	4
Medial condyle	6	1

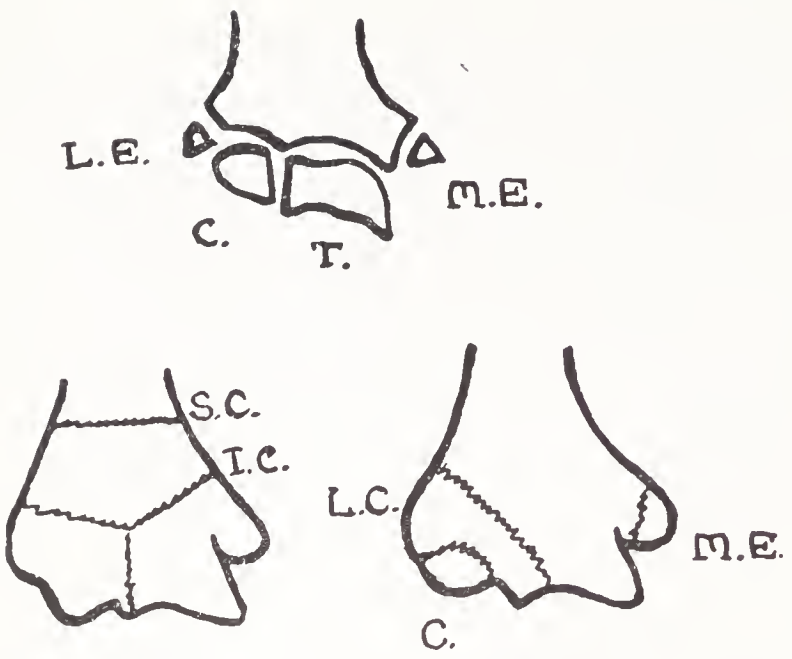

Fig. 2.—Epiphyses and Common Fractures of the Lower End of the Humerus.

L.E.: lateral epicondyle; M.E.: medial epicondyle; C.: capitulum; T.: trochlea; L.C.: lateral epicondyle; S.C.: supracondylar; I.C.: intercondylar.

Supracondylar Fracture. This injury, commonest from 5 to 7 years of age, is seldom sustained after the age of twenty. It usually follows a fall on the outstretched hand with slight elbow flexion. The resultant fracture line usually runs obliquely upwards and backwards above the condyles of the humerus. Siris reports no displacement of the fracture line in 22%, posterior displacement of the lower end of the humerus in 74% and anterior displacement in 4%. The latter type of displacement is, therefore, uncommon and usually due to direct violence on the back of the elbow.

The diagnosis is made by the presence of swelling at the lower end of the humerus due to haemorrhage or displaced fragments with no change in the relationship of the olecranon to the epicondyles of the humerus. The typical position of the arm is pronation with 130° to 140° flexion of the elbow. Some shortening of the arm may be noted.

The treatment is to be based on accurate reduction with care in correcting any anterio-posterior or lateral angulation. The maintenance of a 10° to 15° carrying angle should be born in mind as part of a satisfactory end result. General anaesthetic with closed reduction by manipulation is desirable and may be repeated up to three or four times if necessary. The reduction is accomplished by traction in the long axis of the limb, careful moulding of the lower end of the humerus and gradual flexion to 45° with the forearm semipronated. After check X-rays and careful palpation of the radial pulse, the arm may be immobilized by a wide posterior plaster splint and a bandage from shoulder to wrist. The wrist may then be suspended in a collar-and-cuff sling. After two to three weeks the plaster may be removed and a sling substituted. Function should be almost completely recovered in six to twelve weeks.

Intercondylar T and Y Fracture. These terms designate a T- or Y-shaped fracture with the vertical arm separating the condyles and passing into the joint. One condyle may be displaced and the other remain in fairly normal position or both condyles may be displaced forwards or backwards as in the supracondylar fracture. Intercondylar fractures are more common in adults and usually follow direct violence applied to the tip of the elbow.

An attempt at manipulative reduction by strong traction with the elbow at a right angle, followed by extension and lateral compression should be made especially in children. If successful, immobilization by plaster in almost full extension will likely retain the reduction better than immobilization in flexion. Eastwood suggests maintenance of reduction by gravity with the arm in a sling only. Failure of closed manipulation demands operative reduction and

internal fixation preferably by a plate and screws applied outside the joint capsule.

Fracture of the Capitulum or the Capitular Epiphysis. The separated or fractured fragment may be a cartilage chip, half of the capitulum or the whole epiphysis. Displacement may be anterior, posterior or lateral.

The usual anterior displacement may be reduced by the application of cubital pressure and extension of the elbow. Inadequate reduction will lead to a cubitus valgus deformity possibly complicated, later, by an ulnar nerve palsy. Open operation, especially if the fragment is rotated, is usually quite satisfactory and retention of the reduction can be assured by several catgut sutures through the soft parts about the fracture. If the fragment is separated, replacement, possibly after cutting away the bone from its under surface, is preferred to total excision.

Fracture or Separation of the Medial Epicondyle. The medial epicondylar epiphysis may be fractured or actually separated from the diaphysis of the humerus. This injury occurs most commonly as a result of direct trauma or less commonly through traction by the common forearm flexors in a fall on the outstretched hand. Rupture of the medial ligament of the elbow, inclusion of the epicondyle in the joint, medial dislocation of the elbow, or ulnar nerve palsy are the complications to be watched for in this injury.

If the fracture is uncomplicated, rest of the joint in the flexed position for 2 to 3 weeks results in adequate fibrous union. Complication usually necessitates open operation with the use of internal fixation by a wire or a screw and immobilization in plaster for 6 weeks. Anterior transplantation of the ulnar nerve may also be done during the open operation.

Fracture of the Medial Condyle. Such fractures are quite rare and treatment is similar to that for fracture of the medial epioncdyle.

Fracture of the Lateral Condyle. Separation of the lateral epicondyle is practically unknown but fracture of the lateral condyle is not unusual. Thus the incidence of injury to the two condyles and epicondyles is the reverse.

Fracture of the lateral condyle may follow a fall on the pronated hand with the force transmitted to the condyle through the head of the radius. The resulting fracture will, therefore, include the capitulum and may be accompanied by dislocation of the head of the radius. There is usually some outward rotation of the fragment due to the pull of the extensors of the forearm.

As in fractures of the capitulum, accurate reduction is essential to prevent cubitus valgus (gunstock deformity) or late ulnar palsy due to tension and friction of the nerve. To obtain this, closed manipulation by lateral compression and flexion or open operation with internal fixation may be practised.

Fracture of the Head of the Radius. This fracture is quite common and occurs chiefly in adults following a fall on the outstretched hand with the elbow extended and pronated. The articular surface of the capitulum is usually also damaged and disclocation of the head of the radius may occur. Tenderness can be elicited over the head of the radius on palpation and there is severe pain on extension, pronation and supination of the elbow joint.

For purposes of treatment these fractures are divided into three types.

Fissure fractures may be treated by a sling for 3 weeks with active movement begun after 10 days. Marginal fractures with displacement of a bone-chip may be treated by a posterior gutter splint for 2 weeks followed by a sling with active movement for another 3 weeks. More severe displacements call for removal of the offending bone-chip or removal of the radial head, preferably within 10 days of the injury. Comminuted fractures are best suited to early excision of the head of the radius at the upper border of the annular ligament by a posterior approach.

Fracture of the Olecranon. Direct violence applied to the tip of the elbow may result in a separation of a small or large section of the olecranon from the ulna.

Treatment depends upon the amount of separation between the fractured fragment and the ulna which, in turn, depends upon the involvement of the Triceps insertion in the fracture. Fracture of the olecranon with slight or no separation may be adequately treated by immobilization in an anterior plaster splint with the forearm in the degree of extension required to reduce the separation. If the separation is great, as it is in about half the cases, open operation offers two methods of repair. The first is internal fixation of the fracture site by catgut, wire or fascia lata, with care to obtain close apposition of the fragments; the second is excision of the olecranon with re-attachment of the Triceps to the upper end of the ulna (Wilson). Immobilization should follow internal fixation for about 5 weeks in a right-angle plaster cast.

Fracture of the Coronoid Process. This fracture most commonly occurs as a complication of backward dislocation of both bones of the forearm. The fractured fragment is usually part of the articular margin of the coronoid proximal to the attachment of the Brachialis. Consequently, immobilization of the affected elbow in flexion for a few weeks will usually be followed by adequate restoration of function. Excision of the fragment may be necessary after correction of the complicating elbow injury.

Monteggia Fracture. It has already been mentioned that anterior dislocation of the head of the radius may be accompanied by a fracture of the proximal portion of the shaft of the ulna. This type of fracture, called a Monteggia fracture, dramatically illustrates the need for X-rays of the whole forearm to exclude fracture of the ulna in dislocations of the head of the radius. The usual extension type of Monteggia fracture, is reduced by traction to the forearm with the elbow flexed to a right angle and immobilization by plaster in this position. Very often, open operation with plating of the ulna is necessary.

Complications of Elbow Fractures. (*a*) Volkmann's Ischaemic Contracture occurs not uncommonly following supracondylar fracture and may be due to primary vessel contusion at the time of fracture or secondary vascular obstruction due to immobilization by a tight encircling bandage or extreme flexion. To try to prevent this complication various procedures have been suggested. Fractures and dislocations about the elbow should be treated early and circular compression of the arm should be avoided. After treatment absence of the radial pulse, pain, swelling, or cyanosis of the affected limb are all danger signals. All immobilization should be discontinued and possibly operative exposure of the fracture made. In spite of these precautions

it must be stated that contracture may occur in any position of the elbow and even without obliteration of the radial pulse.

(*b*) Myositis Ossificans following dislocation or fracture about the elbow is actually the formation of new bone in a subperiosteal haematoma. The old theory of osteoblasts laying down bone in muscle has been disproved. Thus, this is an avoidable complication and can be prevented or reduced by the use of gentle manipulation in the treatment of elbow fractures and prohibition of massage or passive stretching during the patient's convalescence. There seems to be little evidence that prevention of active movement will speed recovery from this complication (Watson Jones).

(*c*) Ulnar, median or radial nerve palsies may follow stretching or contusion of the nerve during fracture or reduction. They should be treated expectantly by non-interference unless direct violence was a factor in the mechanism of fracture.

(*d*) Improper reduction with resultant deformity is best treated by late osteotomy rather than open operation in an old fracture. Cubitus valgus deformity may follow lateral condylar injuries and cause an increase of the carrying angle. Cubitis varus is less common and results in a loss of the carrying angle (see fig. 3). Antero-posterior deformity of the lower end of the humerus is a more serious deformity than the two just mentioned.

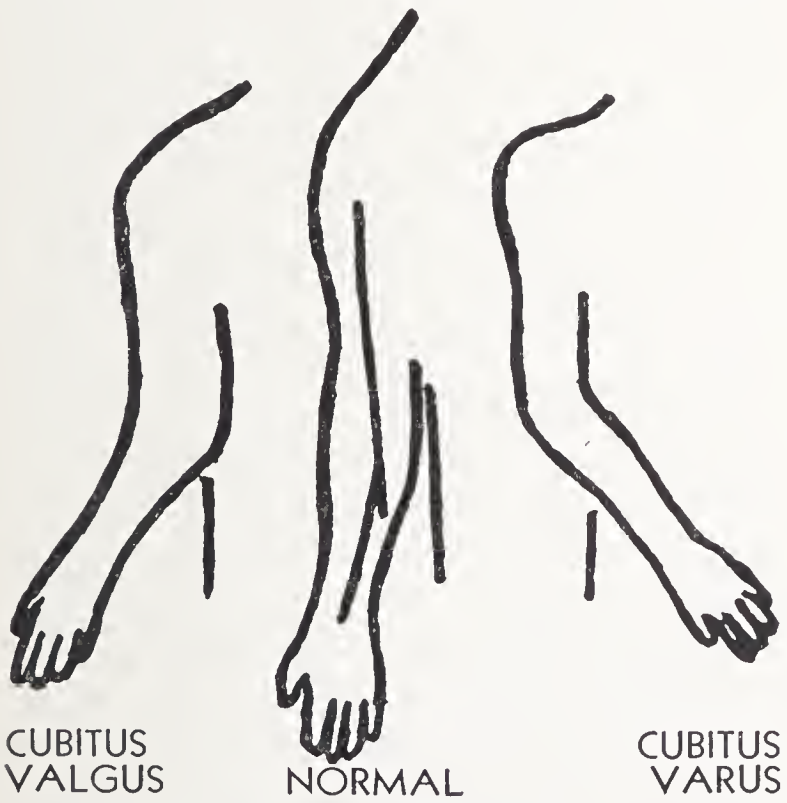

Fig. 3.—Normal Carrying Angle and Deformities of the Elbow Joint.

(*e*) Other complications such as implication of the elbow joint or dislocation have already been mentioned. Loose bodies in the joint are of serious consequence and should be removed. Delayed union and non-union are not considered in this article. Open or compound fractures of the elbow are practically unknown in civilian practice.

SUMMARY

1. The surgical anatomy of the elbow joint has been reviewed.

2. Clinical examination and estimation of joint movement are discussed in general and in detail with specific injuries.

3. The common injuries of the elbow joint following trauma are dealt with in a concise manner. The importance of these injuries in children and their complications in adults are mentioned.

Three important principles are stressed by Watson Jones in the treatment of all elbow injuries: (*a*) to restore smooth, undamaged articular surfaces before movement is begun; (*b*) to avoid using metallic foreign bodies close to the joint; (*c*) to avoid forcing and stretching the joint.

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CHILDHOOD DIABETES, PART II

E. R. YENDT, M.D.

It is my purpose to deal with the complications of childhood diabetes. Broadly speaking complications may be divided into two main groups—those appearing during childhood and those which have their onset later—usually during adult life.

The complications occurring during childhood include acidosis and coma, insulin reactions, infection, skin lesions, disturbances of growth and development, psychological and behaviour problems, and hepatomegaly. In a paper of this length it is impossible to deal at great length with each of these complications. For this reason I am going to dispose of insulin reactions, acidosis and coma by merely mentioning them, for although they are of tremendous importance, I feel that more will be gained by discussing the aspects of this problem with which most are less familiar.

INFECTIONS

Infections until recently have been second in importance to coma as the cause of death in young diabetic patients. Usually the sites of infection and the type of organism were almost specific—staphylococci were the usual offenders and the characteristic lesions were abscesses and carbuncles, osteomyelitis and pyelonephritis. The exact nature of the lowered resistance to infection in uncontrolled diabetes is not known. Contrary to the opinion held by many, recent investigators feel that it is not dependent upon the high sugar content of the tissues, although it may conceivably be due to low glycogen content. Infection is, however, no longer the problem in diabetes that it was formerly, for with proper treatment the response of the patient approaches the normal. The advent of sulphonamides and penicillin has also greatly simplified the problem of infection.

Before leaving the question of infections, the problem of pulmonary tuberculosis in diabetes must be considered. In 1931, pulmonary tuberculosis was found to be twelve times commoner in juvenile diabetics than in non-diabetics in the school children of Massachusetts. The susceptibility of the diabetic patient to pulmonary tuberculosis depends largely upon the control of diabetes, so with the better control of the present day, this figure is probably much less. However, the danger is still present and must not be forgotten.

HEPATOMEGALY

Liver enlargement is sometimes found in diabetic children. These children usually have protuberant abdomens and many suffer from bouts of abdominal pain. Retardation of growth often accompanies the condition. The cause of this enlargement has not been proven because of lack of biopsy and autopsy material. However, the cases seen in the Joslin clinic occurred in poorly controlled children in whom a moderate hypercholesterolaemia was the rule. It is generally assumed that the enlargement is due to a fatty infiltration of the liver —but glycogen deposition and hydropic degeneration of the liver cells have been mentioned as possible factors. The condition is corrected by good control and is usually preventable in the same manner.

PSEUDO-DWARFISM

Another complication of juvenile diabetes is a disturbance of growth and

development. Although the great majority of diabetic children have a normal propensity for growth, retardation is sometimes seen and is referred to as diabetic "pseudo-dwarfism." The child most susceptible to retardation is the one whose age at the onset of diabetes is under five years. Boys appear to be more susceptible than girls. Retardation of growth is often accompanied by obesity, a protuberant abdomen and hepatomegaly, immature behaviour, sexual retardation and delayed ossification. Intelligence, however, remains normal. Several treatments have been suggested but it appears that the greatest acceleration of growth follows the use of testosterone in retarded boys.

RARE SKIN LESIONS

Certain skin lesions, besides infection, sometimes occur in the diabetic child. These include xanthosis, diabetic xanthomata and necrobiosis lipoidica diabeticorum. Xanthosis is a yellow-orange discolouration of the skin, most marked on the nasolabial folds and on the plantar and palmar surfaces. The condition is not confined to diabetic patients. It appears to be due to the high carotin content of the diet or its faulty utilization in diabetes. Omission of vegetables with a high carotin content promotes a rapid recovery.

The appearance of xanthomata in diabetes is a rare complication. The condition is characterized by the appearance in the skin of yellowish tubercles with a red periphery. The tubercles vary in size from a pinhead to a small pea and are usually found on the extensor surfaces of the arms and legs. These lesions are associated with faulty fat metabolism indicated by hypercholesterolaemia and disappear when the latter is corrected by adequate control.

Necrobiosis lipoidica diabeticorum is another rare skin lesior which may complicate diabetes. It is found almost exclusively in young patients and predominately in females and is characterized by the appearance—usually on the lower legs—of sharply bordered, elevated, red papules 1-3 mms. in diameter. These later become plaque-like with a smooth, glistening surface. The lesions tend to fade, sometimes leaving white scars. The cause is unknown and there is no treatment except excellent control of the diabetes and ordinary care of the lesions if they become ulcerated.

PSYCHOLOGIC PROBLEMS

The psychologic and behaviour problems of the diabetic child have been somewhat neglected by many writers. For example, in Joslin's book of over 800 pages dealing with the subject of diabetes, there is but one paragraph devoted to the psychologic problems of the diabetic child. This does not mean that the subject is of little importance—the contrary is true—and the understanding of these problems is a necessity for anyone who undertakes treating a diabetic child.

Even normal children exhibit temporary alterations in behaviour in the transition from childhood and adolescence to adult life. However, these alterations are more pronounced in diabetic children because of the abnormal regimentation to which they are subjected and because of certain psychic and physical factors associated with their condition.

In the home, the relationship between the family members, the financial status of the home, and the emotional stability of the home are all important factors. In families with a low income, the financial burden of caring for a chronic

illness imposes a considerable strain. Economic insecurity may produce tension and discord which is shared by the children.

There are two extremes of parental reaction to the diabetic child, both of which are exceedingly harmful. On the one extreme, rejection of the child is voiced because he becomes an unwanted burden. Usually such a reaction produces a belligerent child. The other extreme — oversolicitude — is probably more common and just as harmful. Many a child is spoiled because he has been pampered and has had things his own way. At home he is the pivot around which all revolves and he grows completely selfish and self-centered.

A problem in the school and play group is the fact that all the children are unable to participate fully in competitive sports. They are compelled to offer excuses and this accentuates their feeling of difference.

In general, the influence of maturity on the diabetic patient has been favourable. With the approach of adult life, the adjustment of most patients improves. However, certain problems do arise in this period. For example, some girls fear that diabetes will interfere with their chances of getting married and having children. As adulthood is approached these fears may be accentuated. The attainment of marriage itself seems more difficult, especially in girls. Fears concerned with the burdens of diet and insulin as well as the possibility of transmitting diabetes to their offspring are not uncommon.

In addition to the factors already mentioned, diabetes itself may have specific effects on behaviour due to the essential nature of the disease. Hypoglycaemia produces harmful effects. Although most parents realize that pallor, sweating, dizziness and tremors are signs of hypoglycaemia, many may not know that in milder degrees the younger children become irritable and fretful. These children may be scolded or punished because of actions beyond their control and this may start a chain of circumstances which will affect future behaviour patterns. The occurrence of a more severe hypoglycaemic reaction may be accompanied by confusion, negativism, and violent outbursts, and when this takes place in public it often leads to embarrassment. Frequent and prolonged reactions to insulin over a period of years may affect cerebral function with consequent mental deterioration.

The dread of, or development of, chronic complications imposes quite a problem. Younger children do not worry much about possible complications. Adolescents, however, learn of these complications—and worry about their future may cause a chronic state of anxiety or depression.

While on the subject of behaviour problems, I should like briefly to refer to the intelligence of diabetic children. One often hears it said that these children are especially bright. The Joslin clinic has reported higher intelligence quotients amongst their children but this may be due to the fact that many of their patients come from a higher socio-economic group. Numerous other investigators have reported that diabetic children are neither significantly brighter nor duller than normal children.

The problem of the physician regarding these behaviour problems is essentially their prevention. If he realizes the special problems of these children, a great step is already made in that direction. Then he can carry out an intelligent educational program for both

parents and child. If the child can be treated at a clinic or by a doctor who can keep the diabetes under good control without instilling an ever present consciousness of carbohydrates, urinalyses and insulin reactions into the patient, that is a great aid. Since it is the child who is different from his playfellows who is the candidate for a neurosis, an attempt should be made to allow him to be as similar to his playmates as possible without endangering the standard of diabetic control.

LATE COMPLICATIONS

The magnitude of the problem of late complications of diabetes is becoming more apparent with the increasing number of anxious reports on the mounting incidence of seemingly inevitable degenerative sequelae. In the remainder of this paper, I wish to discuss these complications with special reference to their frequency; to what is known of their cause; to their pathology and finally to their prevention.

Arteriosclerosis

The chief degenerative sequelae are arteriosclerosis, renal disease and ocular changes. Diabetic arteriosclerosis attacks chiefly the arteries of the leg and the heart. This often results in gangrene of the lower extremities. Angina pectoris, acute coronary occlusion and congestive heart failure are all becoming increasingly common amongst diabetic patients. Atherosclerosis is the common form of arterial disease in these patients.

The cause of premature arteriosclerosis in the diabetic has been the subject of much investigation. The real cause, however, remains unknown. In the past, arteriosclerosis has been attributed to the disturbances of normal physiology which accompany diabetes. Lately, the possibility is also being considered that both the diabetes and the vascular disorders may be due to some more fundamental common factor.

The physiological disturbances in diabetes include disturbed cellular nutrition, dehydration, trauma from changes in osmotic pressure due to a fluctuating blood sugar or from a disturbed blood pH, hypercholesterolaemia, and hyperglycaemia. All of these may be possible aetiological factors.

Joslin does not believe that hyperglycaemia up to 200 mgms % is particularly harmful so long as the urine is sugar free. Whether or not higher values are harmful to the arteries is not known. Shields Warren suggests that fluctuation of the blood sugar may disturb the osmotic pressure relationship and increase the permeability of the intima. Given such an abnormal intima, atheromata might then develop in proportion to the amount of fatty substances in the blood stream.

More attention has been paid to the possibility of a high blood lipid content as an important factor in the production of arterial changes. Joslin attached considerable importance to disturbances of fat metabolism and believes that the chief cause of premature development of arteriosclerosis in diabetes is an excess of fat in the body (that is—obesity), in the diet, and in the blood. Blood lipids tend to be above normal when diabetes is not under good control. Their level rises with the severity of the disease and is maximal in patients with a tendency to ketosis. Cholesterol is intimately related to fats physiologically. Its level in the blood is a fairly accurate index of the level of total lipids. The total cholesterol content of the plasma of normal individuals varies

from 110 to 230 mgms %. Insulin corrects the hyperlipaemia of both clinical and experimental diabetes—and in the well controlled diabetic the blood lipids are usually within normal limits.

Rabinowitch believes that there is a definite relationship between blood cholesterol and the development of atherosclerosis. He found the average cholesterol content of the blood plasma to be significantly greater in younger diabetic patients with arterial disease than in those of the same age group who escaped it. He admits that in some cases normal levels are found, but he does not believe that this disproves any causal relationship. Factors other than the total cholesterol levels may be iinportant. For example, the cholesterol ester: cholesterol ratio has been found to be increased in arteriosclerotic diabetics whose total blood cholesterol values were normal. The problem of cholesterol and arteriosclerosis is a very difficult one, however, and just how the arterial changes are brought about is not clear.

There is one important clinical problem arising from the preceding discussion and that concerns the constituents of the diabetic diet—more specifically, the amounts of fats and carbohydrate in the diet. The diets generally prescribed for the *adult* today contain a moderate amount of carbohydrate—150 to 175 gms. on the average—and fat in the neighbourhood of 80 to 100 gms. daily. Another diet still in use by a few diabetic specialists is the low-carbohydrate-high-fat diet. More recently, several men, including Rabinowitch of Montreal, have advocated a diet which more closely approaches the normal and contains 200-300 gms. of carbohydrate and less than 50 gms. of fat. I cannot go into the pros and cons of all these diets—it is the latter which I wish to discuss more fully, since Rabinowitch claims that it delays the onset of degenerative sequelae.

In 1934, he produced figures showing that this diet causes a fall in plasma cholesterol—not only of those patients who have been on a low-carbohydrate-high-fat diet but also in those who have been on a moderate carbohydrate diet. In addition, he feels that this diet delays the onset of cardiovascular disease in the cases investigated.

In 1944, Rabinowitch reported a further modification of his diet, in which proteins were increased and mid-meal feedings of 20 gms. of carbohydrate were introduced. He also suggests a mechanism by which such a diet may delay degenerative sequelae, other than by a reduction of plasma cholesterol. It may be due to the beneficial effects of the diet on protein metabolism. One of the striking results of the diet is nitrogen retention, whereas with the older diets, maintenance of nitrogen equilibrium was difficult. He also stresses the importance of mid-meal feedings because of the fact that carbohydrates exert their maximum protein-sparing action only when they are available at the time when protein metabolism is going on at its maximum. He does not make clear the exact role of improved protein metabolism in prevention of degenerative sequelae but seems to feel that improvement in general nutrition may increase the resistance of the body to these changes.

Renal Disease

The development of a distinctive renal lesion in association with diabetes was first described by Kimmelstiel and Wilson in 1936. It is known as intercapillary glomerulosclerosis. Renal disease is now being found with increasing frequency amongst diabetic patients.

The Montreal group have recently published a paper reporting the death of four of their juvenile diabetic patients with uraemia resulting from this complication. An opening paragraph of this paper describes the situation regarding this complication so well that I shall quote it: "We were watching the progress of the young diabetic. He or she attained normal growth, did reasonably well in school and college, and later at work. It was generally felt that they would live a healthy life with normal expectancy. Out first jolt came in 1941. A young diabetic patient aged 30 was admitted to hospital and died in uraemia. Since then we have had four similar deaths—and in the outdoor clinic are now seven young diabetic patients showing signs of this same syndrome."

In this group of patients the average age at death was 28; the average duration of the diabetes was around 15 years. After clinical evidence of the onset of renal disease, the average period of survival was less than two years.

Pathologically, this disease is characterized by the presence of hyaline masses lying between the capillaries of the glomerular tufts. In the autopsy material of the Montreal cases there was found diffuse glomerular sclerosis and hyalinization, tubular atrophy, interstitial lymphocytic infiltration and mild-to-moderate intra-renal vascular lesions in the nature of hyaline arteriolar sclerosis and intimal thickening of larger arteries. However, the focal hyaline glomerular deposits of Kimmelstiel and Wilson were not seen.

Clinically, the condition is characterized by albuminuria and hypertension. In addition, retinopathy leading to blindness is an outstanding feature. A sudden onset of impaired vision involving one eye, a dull heavy feeling over the eyebrow and pain behind the eyeballs are common complaints. So universal were the eye symptoms that the progress of the syndrome could be judged by the extent and progress of these changes.

Again, the precise cause of this condition is not known. However, certain factors, present in nearly all the cases of the Montreal group, are significant—all had diabetes for over 12 years; control was difficult in all; diet was often broken, and repeated infections were present.

Ocular Changes

The last group of degenerative sequlaee which I wish to discuss are ocular changes. These changes include diabetic retinopathy and cataract. The frequency of diabetic retinopathy is increasing steadily in the general run of diabetic patients and especially in the younger age groups. Wagener found that it occurred in 60% of cases of more than ten years duration. This condition is characterized by the formation of small, round, punctate haemorrhages distributed chiefly in the perimacular region. These haemorrhages are small and round because they occur in the deeper layers of the retina and correspond to the deeper end ramifications of the vessels. Along with the haemorrhages are usually found discrete white deposits, sometimes called "waxy deposits." The outlines of these deposits are sharp and clear. Diabetic retinopathy is often seen in the presence of no gross abnormability of the retinal vessels, although sclerosis of the retinal vessels is often seen as well.

Sometimes a different and more severe picture is seen in which large pre-retinal haemorrhages, and haemorrhages into the vitreous, occur. The incomplete absorption of these haemorrhages leads to organization and the formation of connective tissue in front of the retina, a course of events which nearly always

causes blindness. This condition is known as retinitis proliferans.

It was formerly believed that the lesions of diabetic retinopathy could be explained as due to arteriosclerosis or complicating hypertension; however, many cases are seen unaccompanied by either of these two conditions. Whereas in hypertensive retinopathy the vascular lesions affect the arterial side of the circulation, in diabetes the changes point to the venous side. It is thought by some that venous stasis and micro-aneurysms of the capillaries represent the fundamental change.

At the present time considerable attention is being paid to capillary fragility in cases of diabetic retinitis. This has been found to be increased in many cases and especially in retinitis proliferans. The effect of vitamin P, the so called fragility vitamin, and rutin, which exerts similar physiological activity, is being studied in some of these patients. Although some favourable reports have been made it is still too early to evaluate the effectiveness of this therapy.

In the opinion of most writers, once diabetic retinitis has developed, control of diabetes by insulin or diet has not much effect upon its course and the lesions usually progress. The progression is often slow with long stationary periods. Again there is not universal agreement and O'Brien and Allen have reported some remissions with treatment. However, the haemorrhages are sometimes absorbed spontaneously, making the effects of specific therapeutic measures difficult to evaluate. The prognosis for sight, except in cases of retinitis proliferans, is fairly good.

Another ocular complication of diabetes is the appearance of cataract. This condition may appear in childhood and in cases of relatively short duration. In the experience of most authorities, cataract is a complication of poor control. There are numerous varieties of cataract of the ocular lens. Diabetes is usually considered to be the cause when the opacities are of the so-called snow-flake variety, in which small grayish white flaky opacities are seen in the anterior and posterior portions of the lens. Later on, the whole lens may become opaque, causing blindness. It is recognized that diabetic cataract may form and mature within a few days, but the period of maturation is usually longer than this. Other types of cataract than the snow-flake variety are often found in diabetes, but these may also occur following ocular injury or disease, or in senility.

PREVENTION

I wish to conclude the paper by discussing the problem of prevention of these complications. I have already mentioned the possibility of prevention using the high-carbohydrate-low-fat diet. The question as to whether or not these complications can be prevented by good control is highly controversial. Opinions of various specialists in diabetes range from one extreme to the other. It is amazing that such widely divergent views can be held; this is a good indication that much work still remains to be done on the subject. Some of the difficulty undoubtedly is due to the fact that there is no agreement among specialists as to what constitutes efficient regulation. If continued sugar freedom and normal blood sugars are an indication of efficient control, then it is probable that few cases meet these requirements. Another factor which is probably often forgotten in evaluating the effect of treatment is the influence of a preceding period of neglect or non-treatment.

Whatever the answer may be, it must be apparent after this discussion that the incidence of degenerative sequelae is tremendously high. Furthermore, the problem is greatest in the case of the juvenile diabetic patient for although insulin has kept these patients alive, it has not prevented their developing complications.

In conclusion, I wish to quote a few lines written by Minsky—

"There can be no doubt that the future of the diabetic is dependent upon elucidating the causes of the vascular changes, and that this may come only from a more vigorous attack on the problem and perhaps the utilization of new avenues. The energy expended on the pseudo-mathematical concepts regarding clinical therapy should be utilized for these studies rather than for the continuation of agelong controversies.

It is obvious that medical science has made possible a much longer life for the diabetic but in so doing it has uncovered a new yoke. It is medicine's duty to remove that yoke—*this* is our challenge for the future."

Acknowledgement

The author wishes to express his appreciation to Dr. A. L. Chute for his valuable assistance in the preparation of this article, which is a condensation of a paper presented before the Alpha Omega Alpha Society at the home of Professor Alan Brown.

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THE ROLE OF VAGINAL SMEARS IN THE DIAGNOSIS OE CANCER

RODGER M. HINES, 5T0

For several years increasing interest has been shown by the general public and the medical profession in the use of vaginal smears to detect malignant tumours of the female genital tract. It seems timely, therefore, to assess the accuracy and value of this weapon in the war against cancer.

ACCURACY OF THE METHOD AND SOURCES OF ERROR IN IT

The greatest factor producing accuracy is the ability and experience of the examiner. Several conditions greatly increase the chance of error in diagnosis for even the most experienced cytologist.

1. Sources of Error Tending to Give False Positive Diagnoses.
   - *a.* chronic infections—the presence of histiocytes is troublesome.
   - *b.* metaplasia of gland cells—as occurs in infections and pregnancy.
   - *c.* hyperplasia of endometrial or endocervical cells.
   - *d.* diminished ovarian function.
   - *e.* post-radiation reaction—leading to the presence of atypical cells.
   - *f.* distortion of normal cells during fixing and staining.
2. Sources of Error Tending to Give False Negative Diagnoses.
   - *a.* well-differentiated carcinomata.
   - *b.* ulceration and necrosis of the surface of the malignant growth.
   - *c.* degeneration of malignant cells during fixing and staining.
   - *d.* absence of malignant cell at the time the smear is taken.
3. Over-all Accuracy.

Despite the above-mentioned sources of error, published reports of some of the most experienced workers place total incorrectly diagnosed cases at from 0.3 to 4.0% of the cases examined.

The assessment of accuracy, based on correctly diagnosed cases, must be differentiated from the accuracy of diagnosis of each individual smear. No reports have been published on the latter criterion of accuracy. It is apparent that if a smear is diagnosed "negative" and there is strong clinical evidence of malignancy, then the smear will be repeated, possibly several times. Such a case may be reported as "correctly diagnosed" if a positive smear is eventually obtained. The accuracy of a single smear is bound to be much lower than the above-mentioned "cases-diagnosed-correctly" percentage. It is this unreported accuracy of the single smear (or of several smears made at one time) which is of interest in determining the worth of the procedure as a screening device.

Published figures indicating the accuracy of the method vary widely. This variation is due largely to the type of cases included in the series. Some of the series were conducted on known gynaecological cases, others on unscreened individuals. The results correlate more closely if the errors are stated as a percentage of the proven positive cases.

Provided that a method of diagnosis is not intended to replace established procedures, it need not prove absolute accuracy. It has been established that the vaginal smear has a certain amount of reliability and its use has brought to

light unsuspected cases of cancer. On other occasions it has confirmed the diagnosis in suspected, but unproven cases. In six thousand cases (totalled from several reports), five hundred malignant tumours were diagnosed; in only thirty-two of these was the diagnosis made primarily on the basis of smears.

VALUE OF THE METHOD AS A SCREENING DEVICE

At present, a few large scale experiments in cancer detection are being conducted in which vaginal smears are being used as one method of detection, but reports have not yet been published. When these series are reported, unless differentiation is made between the number of diagnosed positive cases in which the smear(s) was positive and the number of cases diagnosed *because* the smear was positive, the reports will contribute little to the justification of the use of the vaginal smear method.

In considering the value of diagnostic clinics for screening large groups of women (as differentiated from suspected cases) for cancer of the genital tract, the following factors require consideration:

1. Age Group. Since the aim is to detect early cancer, the younger age groups of women would have to be encouraged to come to the clinic. But the percentage "finds" would be lower in the younger groups, thus increasing the cost per case diagnosed.

2. Economic Group. It has already been found that, despite the modest charge by screening clinics, the well-to-do women represent the majority of those taking advantage of the service. These are the women who can afford to, and generally do, go to their physician at the earliest sign or symptom referable to their genital tract.

3. Medical Outlook of the Group. Those attending the established clinics are obviously those who are health-minded. These women, too, in the absence of the screening service, would be the first to seek medical advice at the earliest subjective indication. Furthermore, the women who would be encouraged to attend screening clinics, if these are established widely, are in a susceptible age group and the danger of creating cancerophobes cannot be ignored.

4. Interpretation of Results to the Individual.

a. TRUE POSITIVES are the aim of screening and, to the extent found, justify the service.

b. FALSE POSITIVES would lead to unnecessary and expensive investigation and to unwarranted apprehension.

c. FALSE NEGATIVES are deplorable in a "screen." They certainly do occur, but to an unknown extent.

d. TRUE NEGATIVES and false negatives create, despite warnings by the physician, a false sense of security in some women.

5. Time Interval Before Recheck. There is wide variation in the suggested period which should elapse between rechecks.

6. Expense. No reports have been published yet, but unofficial estimates place the cost at $10,000. per positive diagnosis at the present pilot screening clinics. In assessing the place of the vaginal smear, the cost of this part of the service and the number of cases diagnosed by this method must be reported separately.

7. Advantage. When a woman presents herself for a vaginal smear there is the opportunity of getting a history of suggestive symptoms and of making a thorough pelvic examination.

COMPARISON WITH TUBERCULOSIS SURVEYS BY PHOTOFLUOROSCOPY

In tuberculosis surveys by photofluoroscopy, the value of which is widely accepted, the case-finding rate is high, cost per positive diagnosis is low ($ 30. in one recent survey), the procedure is simple and there is a cumulative benefit in that the diagnosis and treatment of one case prevents the possible occurrence of several more cases. The search for cancer by screening methods, including cervical and vaginal smears, differs in nearly every respect; the methods employed at present seem far too expensive for the practical results obtained.

VALUE OF VAGINAL SMEARS IN SPECIAL CIRCUMSTANCES

1. In Providing Additional Evidence. Where there is clinical evidence of genital tract cancer and where biopsy and curettage have proven negative, doubtful, contraindicated or impractical, the use of several smears, taken at intervals, may help establish the diagnosis.

2. Post-radiation Supervision. Deep-seated residual foci of malignant cells will not give positive smears. Superficial recurrences, however are not uncommon. In radiated patients the smears present great difficulty in diagnosis because of the effects of radiation even on normal cells. There is considerable doubt as to the practical value of vaginal smears in post-radiation supervision.

3. Control of Sex Hormone Therapy. Very little work has been done along this line. Pre-treatment smears may help in assessing advisability of hormone therapy and smears made during treatment can determine the adequacy of the treatment.

These special circumstances will arise most frequently in specialist and cancer clinic practice.

CONCLUSIONS

1. The vaginal smear technique is a method of reasonable accuracy.

2. In the hands of gynaecologists it is one more procedure that can be used, when necessary, in the diagnosis and follow-up of cance of the female genital tract.

3. There appears to be little hope that it will prove to be a worthwhile, practical method for screening in the search for cancer.

ACKNOWLEDGEMENT

I wish to thank Dr. Geraldine Maloney for her help in the preparation of this paper.

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THE LIBRARY: A GUIDE TO ITS USE.

AGATHA LEONARD*

"You will be mentally more powerful if you know *where* to find knowledge instantly than if you stuff your head with facts. . . . The man who knows his way about a library is more effective today than the man who knows twenty of the books by heart."

—Lord Stamp, in an address at University College, London, in 1934 on "The Management of the Mind."

How can the student learn to know his way about a library? Only by using it. And in order to use it most effectively, some information about the scope and purpose of the library and an explanation of how and where to find the information that lies in the volumes it contains is essential.

There are more than half a million volumes in the University of Toronto library, and of these about forty thousand are classed in Medicine and housed in the Medical Reading Room, which is conveniently located in the south section of the library, directly next to the Medical building. The library serves primarily the students, graduate and undergraduate, the research workers and the teaching staff of the university.

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The arrangement of books in a library by groups is called "classification." In a general library the grouping is usually determined by the subject matter of the book, and the group or *class-marks* are indicated by a system of symbols. In the University of Toronto Library a very simple classification system has been adopted. The books have been arranged in broad general classes, and the *class-marks* are composed of initial letters or abbreviations, followed usually by additional letters, indicating sub-classes. Thus, the letter M stands for Medicine; MA for Medicine - Anatomy; $\frac{\text{P}}{\text{Med}}$ for Medicine - Periodicals.

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MGy	Obstetrics (in red)
S	Scott, W.A. and Van Wyck, H.B. The essentials of obstetrics and gynecology. 390p. illus. Phila., Lea & Febiger, 1946.

MGy	Van Wyck, Hermon Brookfield (1890-) (jt.author)
S	Scott, W.A. and Van Wyck, H.B. The essentials of obstetrics and gynecology. 1946.

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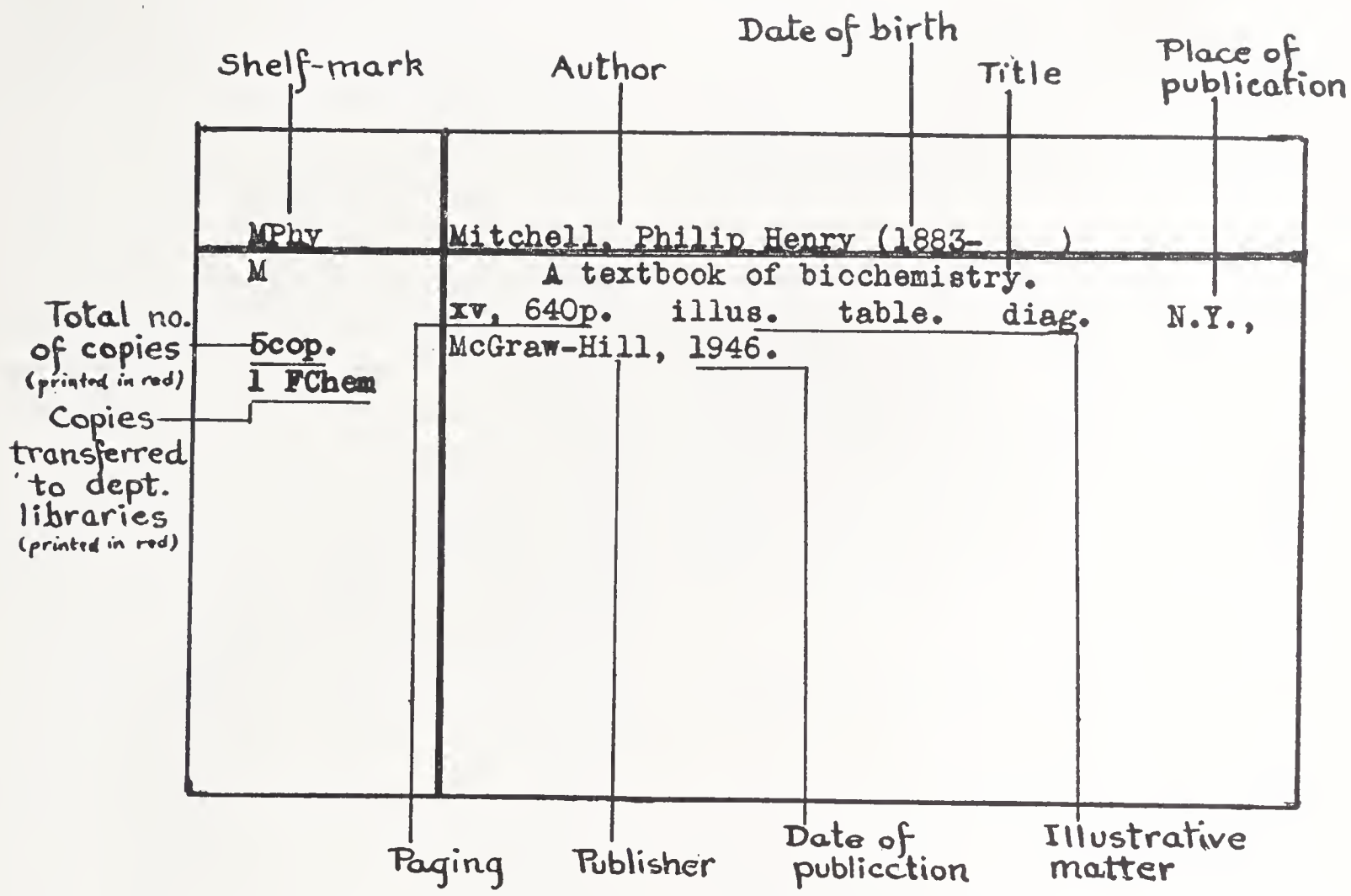

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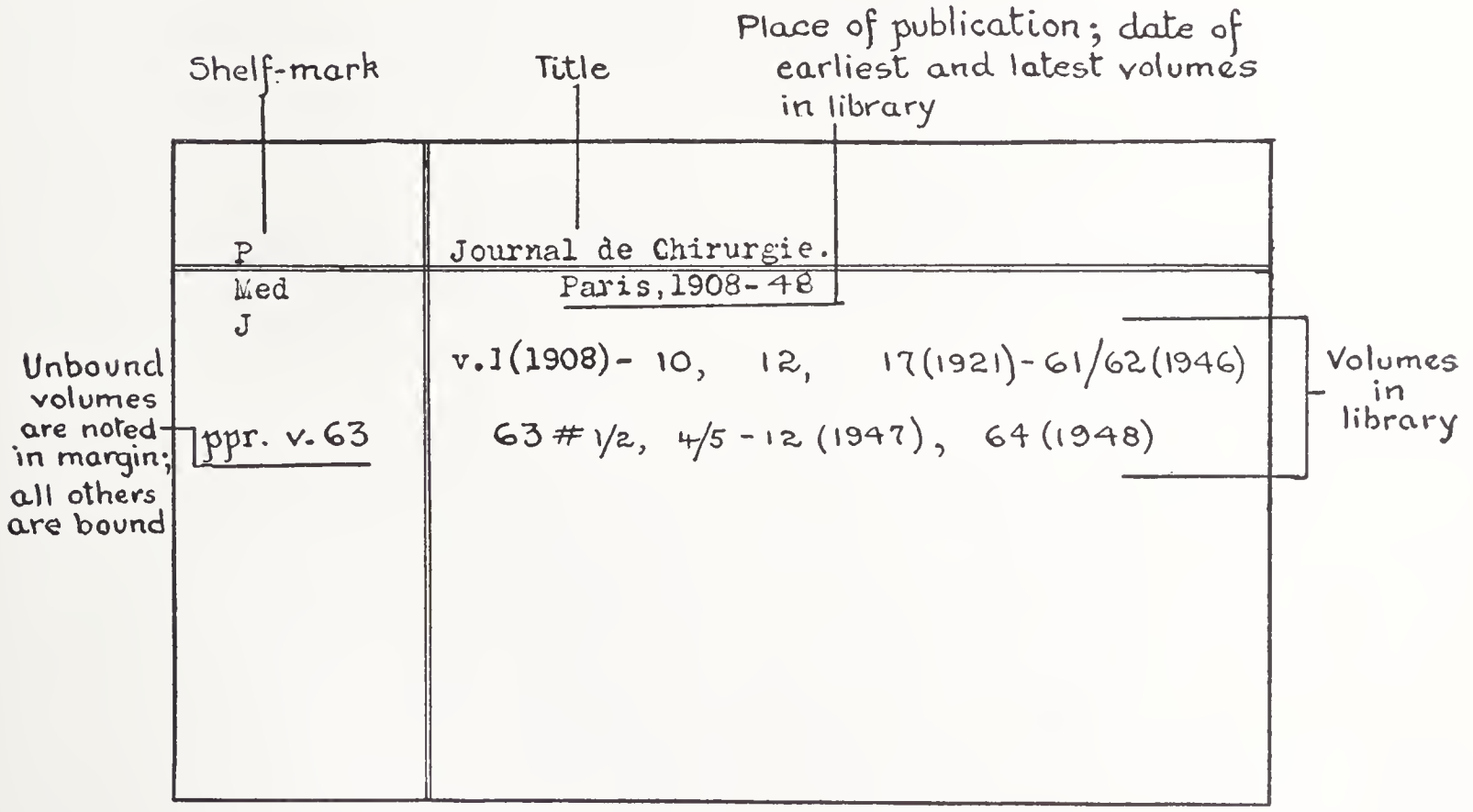

journal give the *volume*, *page*, and *date* of the article you wish to read, but not the author and title of the article. Many medical journals are so large that each volume is bound in several parts, and the *page* indicates which part is wanted.

By using the catalogue you can find any of the volumes in the library. Practical advice on how to use the *text-books* is well discussed in the section on "How to improve your ability to understand" in Ham and Salter's *Doctor in the Making*.

MEDICAL REFERENCE BOOKS

In addition to *text-books*, a student should know how to use *reference* books which contain information in a readily accessible form. A selection of these is kept on the shelves in the east and west alcoves of the Medical Reading Room. They include the following types of books:

Dictionaries—English, French, German, Medical, etc.

Directories, Who's Who, etc.—such as the *American Medical Directory*, and the *Medical Directory* of Great Britain, which list doctors, universities, medical societies, journals, hospitals, and a variety of other information.

Encyclopaedias—*Encyclopaedica Britannica*, for general information; *British Encyclopaedia of Medical Practice*, an alphabetical arrangement of short articles and bibliographies on medical subjects, kept up-to-date by an annual supplementary volume; other encyclopaedias on special subjects.

Systems—The *Nelson Loose-Leaf Living Medicine* and *Nelson Loose-Leaf Living Surgery* and the *Oxford Medicine* and *Oxford Surgery* cover their respective fields in a series of volumes, and have an index volume which refers the reader to the volume and page which contains the information he desires. These "systems" are kept up-to-date by the regular revision of articles which are easily inserted in the loose-leaf binders. There are other "systems" of medicine and surgery in the stacks.

Bibliographies—There are two great reference tools, also kept on the reference shelves, which are a further key to the information that is in the library shelves. These are:

1. *The Index Catalogue of the Library of the Surgeon-General's Office.* The Army Medical Library of the Surgeon-General's Office in Washington is the largest medical library in America, and this catalogue records all the material in the library. Under the author's name are given the books or monographs he has written, while under the subject headings both books and journal articles are listed. The catalogue is issued in a series of volumes, each series covering the entire alphabet, and each volume of the series covers one or more letters. The current volume, for instance, is the M-Met volume of the fourth series, and was published in 1948. To find out all the material in the Army Medical Library on meningitis, one would refer to the M volume of the first, second, third and present series, and need only supplement this by checking the journals published in 1948 and 1949. On the other hand, if material on appendicitis is wanted, the last A volume appeared in 1936, so the *Index Catalogue* is useless for material published later than that date. To supplement it, however, there is a second invaluable reference tool:

2. The *Quarterly Cumulative Index Medicus*. This is a guide to the periodical literature in medicine, arranged alphabetically under subject and author. It is probably the most useful reference work in the field of medical literature and includes articles published in all languages. At the present time, two volumes are issued each year, and each volume indexes the journals published during a six months' period. Unfortunately, since the war, publication of this

index has been slow, and the 1948 volumes have not appeared yet. The library has not, of course, all the articles listed, but as it at present receives about 400 of the most important journals, the most valuable articles should be available here.

The Current List of Medical Literature. To fill the gap between the last bound volume of the *Quarterly Cumulative Index Medicus* and the present time the Army Medical Library issues weekly the *Current List of Medical Literature*, which lists the contents of each journal as it is received in the Library, and has a monthly subject index. Because it is not arranged alphabetically this publication is not so convenient to use, but it can be helpful in tracing the very latest material on a subject.

ABSTRACT JOURNALS

Further guides to medical literature are the *abstract* journals. These publish short abstracts of articles appearing in medical and surgical journals.

British abstracts—This appears in seven sections. Section A III covers physiology, biochemistry, anatomy, pharmacology and experimental medicine, and the current issues and complete indexes are kept in the Medical Reading Room.

Biological abstracts
Chemical abstracts
} Many articles on medical subjects are abstracted in these journals which are available at the Main Library.

Excerpta medica—This new publication is issued in fifteen sections covering the whole field of medicine. The library has only the section on *Internal medicine*, which is received through an exchange with the *University of Toronto Medical Journal* and is kept in the Medical Reading Room.

Many journals have abstract sections in each issue. Some of these are the *Journal of the American Medical Association*, the *Canadian Medical Association Journal*, and journals in the various specialties, such as *Surgery, Gynaecology and Obstetrics*, which abstract articles in their various fields.

REVIEW JOURNALS

Finally, there are the *review* journals, which publish *survey* or *review* articles on certain subjects. Among the most useful of these are:

Annual review of biochemistry
Annual review of physiology
Bacteriological reviews
Physiological reviews
Survey of obstetrics and gynecology

Articles in these journals usually are indexed in the *Quarterly Cumulative Index Medicus.*

BORROWING REGULATIONS

Before borrowing books, students should acquaint themselves with the library regulations, by reading the notices which are posted at the desk. Library rules are sometimes a nuisance, but they have been evolved through a continuous effort to make the library as useful as it can be to everybody.

MALARIA

ZOË CHRISTIE

A SEARCH THROUGH LITERATURE on early life in Canada has revealed numerous references to the incidence of malaria infection in Ontario, which in those days was called lake fever, ague, intermittent fever, or bilious fever.

I quote from C. P. Mulvany's book, *Toronto Past and Present:*

> The foundation of Toronto as the capital of English-speaking Canada in 1794 was by no means resolved on from hygienic considerations. From that point of view, the old French port at Rouille, which was near the mouth of the Humber, had a salubrious, as well as a more pleasant situation. But Governor Simcoe chose the head of the Bay, close to the numberless swamps and estuaries of the Don mouth, for purely military reasons. The early years of York were a constant struggle with malarial disease. But as the population increased, the hygienic condition steadily improved. Swamps were drained, and became first meadows, then the sites of city streets; ravines, such as those which once made impassible chasms on Yonge and Queen streets, were bridged over and filled up. The city, as if by a hygienic instinct, began to move away from the fetid Don banks to the north and west. Ever since this began to be the case, the natural advantages of Toronto came into play, the malarial diseases became less frequent, and the Queen city of Ontario became the healthiest on the American continent."

An excerpt from Lord Selkirk's diary, Nov. 20, 1803, has an interesting reference to malaria infection in early Toronto:

> Near the eastern end of the town is a blockhouse built by President Russell, on an alarm from Brant's Indians. This situation is found to be unhealthy, from the neighbourhood of a marsh of a thousand acres formed by the mouth of the Don. This marsh is not found to affect the garrison, or more distant parts of the town a mile or a mile and a half away. A party of soldiers stationed in the blockhouse last summer were constantly afflicted with fever and ague, while the Germans on a dry bank two miles off were quite healthy. The old town was also more unhealthy than the new part, which is farther from the marsh, and upon Yonge street, a few miles from the town, no fever at all existed. The presence of easterly winds last summer, blowing off the marsh, rendered the town more than usually unhealthy; the ague also made its appearance in Lower Canada, which is very uncommon."

There are many other references to malaria in Canada, too numerous to be included in this article. The disease was reported in the early days from the low ground bordering the Great Lakes, from Peterborough, Haldimand and Elgin counties, from Niagara, along the shores of Lake St. Clair and the valley of the Grand River, from Sarnia, Chatham, Dunnville, Brantford and Coboconk.

Over the years, malaria has gradually disappeared from Ontario and the only explanation given for this disappearance is the reduction in mosquito habitat by improved sanitary conditions, proper drainage and sewage disposal, and better housing.

As a result of the war, a number of service personnel have returned to Canada with chronic malarial infections. The question arises, will malaria become indigenous here in Canada? Dr. T. H. Williams (3) of Winnipeg answers that question in the negative and gives the following reasons: (*a*) The maintenance of malaria endemicity requires certain species of Anopheline mosquitoes. In Canada we have these species of Anopheline but not in any great density. Most of our species belong to the genera *Culex* and *Aedes*. (*b*) There must be a minimum number of infected individuals in whose blood gametocytes circulate and these individuals must be accessible to Anopheline mosquitoes. These cases

are few and widely scattered and due to the high mortality rate of infected mosquitoes the maintenance of endemicity is most unlikely. (*c*) Our more temperate Canadian climate does not favour the development of the infection in the mosquito. Neither the air temperature nor the humidity is maintained at a sufficiently high level to allow any large-scale development of the parasite. (*d*) Malaria is a house disease. Ideal conditions for the spread of the infection are found in hot, ill housed, unscreened and unsanitary localities such as abound in malarious lands. These conditions are not readily found in Canada where the pestiferous, hard-biting Culicine mosquito has forced people to screen doors and windows.

From this combination of unfavourable factors the establishment of malarial endemicity in Canada is very unlikely. However, this does not preclude sporadic cases of transmission of malaria from returned infected service personnel to those who have never been away from non-malarious areas. It is expected that, when conditions are favourable, a few such sporadic cases may occur, and unless the medical profession is awake to the possibility they might be missed.

The subject of diagnosis of malaria is an extensive one; however, I would like to mention briefly a few of the methods: (*a*) For the inexperienced person it is advisable to make a long search through a number of well-stained blood films. Thick films are desirable for those who have had experience, because a larger volume of blood can be examined in a shorter time. (*b*) A diagnosis of malaria should not be made unless the parasite is demonstrated within a red blood cell. Exceptions to this are the gametocytes of *P. falciparum* which are usually found free of their host cells. Many persons have been drenched with quinine because blood platelets were mistaken for plasmodia. One suspicious cell inclusion should not determine a diagnosis of malaria but if there are clinical signs of malaria, patient search will show other infected cells. A good rule is that when in doubt it is nearly always negative. The clear-cut red and blue organisms are not easily mistaken when present and well stained by any good blood stain. Most textbooks on parasitology contain accurate colour plates showing the morphology of the various species of plasmodia. These can be referred to as an aid in diagnosis. (*c*) In many cases of malaria the parasites are very difficult to find in the peripheral blood. It is sometimes helpful in such cases to inject 0.1 cc. of adrenalin intramuscularly and take blood smears in about 20 minutes. Any parasites lurking in the splenic sinuses will have been thrown into the peripheral circulation. (*d*) Fever charts are a fairly reliable aid to diagnosis in single infections but very little emphasis can be put on them in cases of multiple and mixed infections. By multiple infections I mean reinfection at various times by additional bites from infected mosquitoes. Mixed infections are those produced by more than one species of plasmodium at the same time. Feve charts are useless in these cases because they become so varied and do not demonstrate the typical textbook picture.

During the war, great advances were made in the development of synthetic anti-malarial drugs and much was learned about the treatment of the infection. Atebrine was used extensively as a suppressive drug. If administered in correct dosage for an adequate period of time it will prevent infections with *P. falciparum* and suppress, but not prevent, infection with *P. vivax*. The newer drugs, e.g., paludrine and chlorodine, appear to be as effective as atebrine, are less toxic and

are required in smaller dosage. However, an ideal drug is yet to be found.

Another wartime advance in the control of malaria was the discovery of DDT. An excerpt from *New Statesman and Nation* gives a good example of the spectacular results achieved by the use of insecticides in malaria control. "In 1944, Sir Robert Robinson and Sir J. L. Simonsen visited British Guiana where the population had remained static, i.e., the coffins had equalled the cradles, for generations. The leveller was the mosquito, carrier of malaria, yellow fever and filariasis, which bred in the wooden houses. The Mission advised an all-out campaign with insecticides such as DDT. At an annual cost of five shillings a head of the population, malaria has been practically eliminated from the colony. Within eighteen months of the campaign's starting, the birth rate had doubled and the infantile mortality had dropped from over 350 per thousand to 67 per thousand. The population is now increasing by ten per cent annually. An entirely commendable advance; but not unless on the other scientific fronts—agriculture and nutrition—provision is made to feed the newcomers. Otherwise it is merely exchanging disease for famine." (1)

The present day problem with regard to the control of malaria is well outlined in the *Chronicle of the World Health Organization* published by the United Nations. "Despite recent progress achieved in regard to malaria control, the incidence of the disease is still extremely high throughout a large portion of the globe. Millions of deaths and hundreds of millions of cases of malaria still occur annually. The reduced working capacity of populations physically and morally weakened by the disease has far-reaching economic consequences. From its essentially rural character, malaria is, perhaps, the scourge that most profoundly affects the agricultural worker, and hence the production of food. In regions already under cultivation, malaria undermines the strength of the workers and diminishes the number of effective working days—often during the harvest, when all manpower should be available. On the other hand, malaria may prevent the development of regions where agriculture might have prospered. While the world is suffering from a shortage of food, and while the areas devoted to agriculture appear insufficient to meet all needs, the control of malaria in certain agricultural regions becomes an overriding necessity." (2)

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(1) Calder, R., New Statesman and Nation. Feb. 5, 1949.

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(3) Williams, T. H., Malaria in Canada. Jour. of the Can. Med. Services. **2,** 44-46 (1944).

THE UNIVERSITY OF TORONTO MEDICAL JOURNAL

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EDITORIALS

FOR THE NEW YEAR

The thought of editing a publication with the reputation of the UNIVERSITY OF TORONTO MEDICAL JOURNAL must fill every new Editorial Board with grave doubts concerning its ability to maintain the high standards set by its predecessors. The present Board, assured of the assistance of an energetic editorial staff and many co-operative members of the Faculty, feels confident that the success which the Journal has won in the past will again be achieved.

As so often has been reiterated, the success of our undergraduate medical journal ultimately depends upon the interest and cooperation shown by each student of this Faculty. This is not an appeal for assistance in filling these pages. Space that is not taken by student articles can still be used, and well used, by members of the teaching staff. The function of this journal, however, is essentially the expression of *student* thought and no amount of writing by obliging graduates can help us to fulfil this function, nor can it help the student to gain experience in assembling and composing articles—experience which will be invaluable in later years. Avail yourself, then, of the opportunity of preparing an article bearing directly, indirectly, or not at all, on the study of medicine. You will gain satisfying understanding of a particular topic and its ramifications, and useful experience as an author. You will be adding *your* contribution to the further advancement of your own JOURNAL. If enough students respond, we need have no doubts about the success of Volume XXVII.

USING THE MEDICAL READING ROOM

The uses of the medical reading room change throughout the year. As soon as lectures commence in the Fall, many economical students can be found weighing the merits of various textbooks before deciding which to buy. As the year progresses, article writers and seminar leaders ransack the room; and, finally, there is the panic-stricken cramming of students during the last two weeks. All of these people will find Miss A. Leonard's article in this issue of great value. It is a clear explanation of the most important medical aids to knowledge, such as the *Index Medicus* and the *Quarterly Cumulative Index*. Without these works, the approach to the recent medical literature is formidable and the average student would be apt to ignore it.

It is well to sound a note of warning at this time. The bulk of medical knowledge is startling at any time, but it is also very ephemeral. In five year's time many of the techniques and theories we learn at this present will be obsolete, and half a dozen successors may have followed them to the archives of oblivion.

If a physician wants to stay mentally alive, he must keep up to date. "That which addeth not, taketh away." A daily habit of half an hour with the journals is the best insurance against becoming a poorly preserved fossil of the medical knowledge of one's graduating year; and once the habit is established it is as absorbing and enjoyable as the comics and the sports page to a teenager. It is a way of establishing oneself in the present. The journal habit can be acquired most easily in the medical reading room, where the latest numbers of the most important journals are displayed on a table in the centre of the room.

Any student who has cause to stray beyond the scope of the medical reading room is entitled to use not only the facilities of the main university library, but also the following departmental and professional libraries:

A. Departmental Libraries: (These are branches of the University Library, but regulations regarding the borrowing of books and use of facilities are made by the departments concerned).

Physics Library	....	Physics Building	
Chemistry	"	Chemistry	"
Zoology	"	Zoology	"
Psychology	"	Psychology	"
Anatomy	"	Anatomy	"
Dental	"	Dental	"
Pathology	"	Banting Institute	
School of Nursing Library	....	School of Nursing.	

B. Connaught Medical Research Laboratories Library: in the School of Hygiene Building, specializes in works on Hygiene, Preventive Medicine, Bacteriology and Epidemiology.

C. Academy of Medicine Library: 280 Bloor Street W., is owned by and for the use of the members of the Academy of Medicine. Students, upon presenting a recommendation from someone on the faculty of medicine, may use their facilities.

D. J. L.

NEWS AND NOTES

Several years ago our Journal published a department entitled "News and Notes." A questionnaire, distributed last spring, indicated that the majority of students were in favour of a regularly appearing brief outline of current student activities, staff appointments or changes, alumni news and other interesting items. For this reason the venerable, but long neglected department has been revived. We hope that it will supply you with entertaining and useful information.

HUMANISM AND MEDICINE

H. B. VAN WYCK[1]

PART VII

THE HELLENISTIC PERIOD AND THE ALEXANDRIAN SCHOOLS

In the development of our present civilization there have been three historical periods to which the school curricula have paid too little attention —the Byzantine period of 1,000 years during which the Eastern Roman Empire, centered at Constantinople, remained a bulwark against the East; the Dark and Middle Ages, the 1,000 years between the fall of Rome and the Renaissance; and the Hellenistic civilization which followed the great Age of Greece. The reasons for the comparative lessening of interest in the two former periods are less obvious than in the latter. For the civilization which centered about Alexandria from 300 B.C. to 200 A.D. lacked much of the picturesqueness that adorned the annals of the Byzantine Empire and the mediaeval west. There were few exciting figures, almost no imaginative artists, and more heat than light was generated by the intellectuals of Alexandria, who fostered the sterile and discarded religious systems of Stoicism and Epicureanism. This was, however, a period of development of intense practical science and it did see the inception of Christianity.

As the shadow of the Macedonian conqueror eclipsed the sun above the Greek world, it must have seemed to the free spirits of Athens that their universe was toppling. Demosthenes, the prince of orators, who had opposed Alexander, and the aged Aristotle, put an end to their lives with hemlock. One cannot but recall the memorable phrase of Sir Edward Grey when he saw the failure of his diplomacy result in the outbreak of the first Great World War; "The lights of Europe are being put out." The glory that was Greece, however, was to continue to shine steadily, if less brightly on an African shore; and, after an interlude of several centuries, to fade into the rising sun of the grandeur that was Rome. That interlude is the Hellenistic period.

Alexander the Great of Macedon overran the Greek mainland in 332 B.C., and established Alexandria as a port in the same year, thus securing a naval base for his designs on Persia and a trade link between Macedonia and the Nile valley. When Alexander died in 323 B.C., his flimsy empire broke up, Egypt was seized by one of his generals, Ptolemy, and the Ptolemaic dynasty ruled the valley of the Nile for three centuries until the coming of Imperial Rome. To Alexandria, the intellectual centre of the world shifted and there it remained until the Roman power moved in on the peoples of the Near East and abolished the Post Alexandrian empires. In 146 B.C. the Greek mainland fell to the Roman legions; and Egypt passed under Roman jurisdiction by 80 B.C. But even though after this period, scientists, philosophers, and traders flocked to Rome as the capital of the world, Alexandria remained an important center of education; a center not only of Hellenism, but also of Semitism and by the third century A.D. an important center of Christian

[1]Head of the Department of Obstetrics and Gynaecology.

theology. These three centuries B.C. with the first two centuries A.D. are known as the Hellenistic age and Alexandria was its centre. The Ptolemaic dynasty, which finally came to an end with the death of the fateful Cleopatra, included many intelligent and capable men and women who maintained the traditions and subsidized the schools of learning. Thus, near the mouth of the Nile, the Greek spirit had a re-birth, but it was a changed spirit. There was a loss of political freedom. The small city states of the pre-Alexandrian Greek world, in spite of disunity and disorder, had maintained the spirit and form of freedom; but now the Greeks were to pass with the rest of the Eastern Mediterranean under first the domination of the military heirs of Alexander, and then finally under the Romans who moved in on their wrecked empires. At first, the Greeks found in exchange for their lost freedom an unstable subjection; but, by the beginning of the Christian era, this gradually changed into the order and protection of the Graeco-Roman world of Imperial Rome.

Of equal importance to the future Europe was the westward march of the Eastern religions. If Alexander Hellenized the east, in exchange for the thin veneer of Greek culture, the East poured back to the despondent and enslaved Greeks, the oriental cults and superstitions that had grown up during centuries of Asiatic depotism. Two religions found new birth in the West before the Christian era—Stoicism and Epicureanism. Both were oriental infiltrations, and both were based on the acceptance of defeat, the former in apathy, the latter in abandonment to pleasure. These new cults were embraced by intellectuals who sought refuge from the disorder and subjection of the last centuries B.C. And if the gloom darkens to-day, and history follows an old pattern, man in his hopelessness may abandon himself either to a Stoic acceptance of defeat, e.g., perhaps in the form of Russian materialism, or to a heedless abandonment to the pleasure of the moment, or to a rebirth of the higher ideals of Judaism and Christianity or some one of the other higher religions of the East. That these religions of defeat, Stoicism and Epicureanism, persisted into the settled Graeco-Roman world of the first centuries A.D. shows that even in the splendid days of the early Roman empire, the spectre of coming doom was in the hearts and minds of the intelligentsia to whom only these philosophical religious cults appealed.

Another change in the Greek spirit was that philosophy, becoming finally divorced from science, lost the brilliance of the preceding period, and tended to become infused with the prevalent oriental mysticism and supernaturalism.

Platonism, which had a practical programme for this world, changed into Neo-Platonism which ignored this world completely. While Plato had built an ideal world of forms in a heaven in the Land of Nowhere, he had described a practical political programme in the *Republic*. But now the Neo-Platonist was to leave this world entirely as of no interest and live in the mystical visions of the spirit. This trend was to mould Christian thought towards asceticism and the neglect of science; and, upon this aspect of Christian theology, the pagan critic has been only too eager to place the blame for the regression of science during the Dark Ages—a conclusion open to further debate. Perhaps the most striking change in the Hellenistic world from the Hellenic was that Science became specialized. With the happy divorce of science and philosophy, although philosophy languished, the practi-

cal sciences flourished and developed a new phase of activity which they can never lose—that of specialization. This meant progress in the basic studies by which alone medicine could continue its scientific tradition. Such radical transformation of the older culture took place in an incandescent intellectualism of which the center was Alexandria.

Alexandria rapidly became a large and strategic port which it has remained up to the present. A meeting place of west and east, Egypt was less exposed to war than the Aegean seaboard or the uplands of Asia and to Alexandria flocked scientists, traders, and the commerce of the ancient world. Most of the eminent men of science were teachers at Alexandria. Even Archimedes, the Sicilian, and Galen of Pergamus had studied at Alexandria. The second Ptolemy founded the famous library and museum and centered about these, the Alexandrian academies attracted most of the eminent scientists of the day. Let us list just the more important of these:—

(1) Euclid, 530-260 B.C., whose famous work on Geometry remained the standard text book down to this century —the longest run of any text book in history.

(2) Aristarchus, 310-230 B.C. The Copernicus of the ancient world, the greatest astronomer of antiquity.

(3) Hipparchus, 190-120 B.C., who developed two brilliant astronomical conceptions: the precession of the equinoxes, and the calculation of eclipses.

(4) Archimedes of Syracuse, 287-212 B.C., the greatest physicist of the ancient world, one of the greatest mathematicians of all time, and by far the most distinguished of the graduates of the Alexandrian Schools.

(5) Herophilus, 300 B.C., was the first important teacher of medicine. He began the practice of dissecting before students human bodies of executed criminals. He recognized that the brain was the seat of the intelligence. The torcular Herophili (wine press of Herophilus) he named the confluence of the sinuses. He carried the observational or empiric approach further than Hippocrates. He retained the theory of the four humours. He wrote a text book in obstetrics. He was the first to make post-mortem examinations. These practices were contrary to the religious instincts of the Greeks and were made possible by the protection of the enlightened Ptolemies.

(6) Erasistratus of Chios, 280 B.C.—The father of physiology—experimented on animals and discovered that the posterior nerve roots convey sensory impulses from the surface of the body and the anterior nerve roots, motor impulses to the muscles. This was forgotten until Sir Charles Bell re-discovered it in 1820. Erasistratus discovered the lacteals in the intestine. He was the first to discard the four humours, and was a sceptic about indiscriminate drugs and venesection. His chief error was the doctrine of the "pneuma"—that air is taken from the lung to the heart and enters the blood as a sort of spirit or life —perhaps a vague anticipation of the circulation of the blood. Both Erasistratus and Herophilus were accused by their contemporaries of dissecting living beings and a Roman historian of medicine, Celsus (c. 30 A.D.), who lived in the reign of Tiberius in the First Century A.D., repeats the story with uncritical credulity. Celsus' own judgment was as follows:

> "To dissect a living body is both cruel and unnecessary; to dissect dead bodies is necessary."

To those who find it hard to believe that the Greeks of the great literature could be as cruel, Gilbert Murray points out

that both Herophilus and Erasistratus were living not in free Greek cities, but under oriental despots, the Ptolemies.

Hellenistic medicine was carried to Rome just before the last century B.C. Asclepiades of Bythynia (125 B.C.) would appear to be the first to introduce to the Romans the best that the East had to offer. He rejected the four humours; and accepted the atomic theory of Democritus as a basis for disease; but had a contempt for anatomical studies. His pupil, Themison of Laodicea (50 B.C.) founded the so-called methodist school of medicine which taught that health and disease arose from the general state of the body as a whole. Soranus was the greatest member of this cult and the outstanding gynaecologist of the ancient world. He gave the first intelligible account of the uterus, introduced the first vaginal speculum, invented an obstetric chair, and practised podalic version. He came to Rome to practise during the last century B.C.

Perhaps the most influential physician of antiquity was Galen of Pergamus (A.D. 129-199). He transmitted to posterity about 150 treatises which systematized the anatomical and physiological knowledge of Greek medicine. His empirical tendencies kept him somewhat under the sway of the prevalent magic and atrology of his time. Having established himself in Rome (160 A.D.) he acquired great popularity and prestige as a physician. His works in the following centuries became the authority for practice both among the Christian nations and throughout the Muslim world, thus rivalling the celebrated Canon of Avicenna. It was through Galen that most of what is known of Greek medicine was transmitted to posterity. His reverence for Hippocrates made him unable to discard the humoral theory. Galen was a handsome Greek, popular in the Imperial court at Rome. He dressed in the latest style of togas, and worked like a navvy. He managed to sail between Scylla and Charybdis—the whirlpool of a too narrow scientific interest and the rocks of a popularity which is an eternal temptation. As it was illegal in Rome to dissect dead bodies, Galen dissected monkeys and pigs. He showed that the arteries contained blood, not the pneuma of Erasistratus; but he never suspected that the heart was a pump and failed to find the link between the arteries and veins—the capillaries. Having found in the mountains the skeleton of a robber who had been killed, he made valuable contribution to the anatomy of bones and joints. Galen was a bold vivisector. He interested himself in studying the separate actions of the diaphragmatic and intercostal elements of respiration. "Toward this end, after cutting the phrenic nerve and observing the intercostal muscles in action, he took another animal and cut the intercostal nerves at the point at which they leave the spinal cord and watched the action of the diaphragm. During the approach to one or another of these nerves, the recurrent nerve was severed by mistake, and the pig stopped squealing. Repetition of the operation produced aphonia in every species upon which he experimented."[1]

Galen wrote 30 books, mostly worthless, on pharmacology; he must have been a fussy therapist. His prescriptions involve the moderate use of opium, wine, honey, hellebore, colocynth, hyocyamus. In his notes is the following comment:

"In case of severe pain we use narcotics, opium, mandragora, and hyocyamus, for as Hippocrates teaches, moderate narcotism relieves pain, yet too powerful narcotics may cause pain."

Galen advised students to study anatomy in Alexandria. He wrote:

[1]Mettler, *History of Medicine*, p. 25, Blakiston.

"This subject is less difficult in Alexandria where they exhibit a skeleton while teaching. Hence it is worthwhile going there for that purpose alone. Even apart from the classroom, it is possible to see, as I often did, skeletons in graves and in monuments. Sometimes the overflow of the Nile washes bodies from the former buried without much care months before, and thrown hither and thither the putrefied flesh is stripped off while the skeleton is left intact. We also saw the skeleton of a brigand lying on the mountain side just off the road, killed by a traveller in self defense. No one wishing to bury him, but on the contrary rejoicing to see him devoured by birds of prey, the bones had been picked dry and thus left for inspection. If nothing like this happens to you, you can at least remove the flesh from an ape and study its bones. Naturally, you will choose one as similar as possible to man. . . . Instructed in this way if you later fall on a human skeleton you will easily recognize the different parts"

Like Aristotle, he began the study of comparative anatomy.

Galen's works are a mixture of sense and nonsense. The nonsense would not have mattered so much if the world had not accepted him as the undisputed authority on all branches of medicine for 1,000 years. Three of his errors retarded scientific advance and claimed many a victim during the Middle Ages:—

(1) That the blood passes through imaginary pores in the cardiac septa between right and left ventricle;

(2) That the four humours of Hippocrates are the basis of biochemistry and physiology;

(3) That pus must form in the healing of wounds.

Galen was an extreme and naive teleologist. This implies complete knowledge. He saw and thought he could explain the direct hand of God in every adaptation of the human body. This endeared him to the Stoics, the early Christian church, and Islam and thus fastened his yoke as an authority on Europe. For Rome, Galen was an episode; for mediaeval Europe, an epoch. Unquestioned authority retards science, just as uncritical reverence for the past debases humanism. However, with all his faults he was the greatest master of scientific method from the 2nd century to Roger Bacon. As the years passed after his death he became almost a divine legendary creature of infallible wisdom. Until the re-birth of science and learning, to learn Galen was to learn all. His works were translated into Latin, Syriac, Arabic, and Hebrew; and, even when their crude mixture of truth and superstition threatened to die in western European Christendom, whenever contact was made with the Eastern culture of Constantinople or with the more virile intellect of Moorish civilization in Spain, our forefathers during the mediaeval period found presented to them again often under other names, the teachings and writings of the foppish yet tireless physician to the élite of the Roman society of the second century A.D.—Galen of Pergamum.

In the writings of the Alexandrians we can note three tendencies in the development of medicine. The two dogmatic schools:

(1) Those who, like Herophilus, accepted fully the humoral theory of disease. These "humoral" physicians believed that dyscrasia or disease could be cured only by drugs; and

(2) Those who, like Erasistratus, discarded the humors but believed in the "pneuma" filling the arteries. When an artery was opened a vacuum was created by the escape of "pneuma" and blood rushed in from the veins. Thus drugs and venesection were to be avoided—the proper treatment being diet, fluids, rest, bathing, and exercise.

(3) A third group, the Empirics, grew out of the skeptical school of philosophy. They denied that you could learn anything. Hence these Empirics discarded all theories and relied on the Empiric tripod: (*a*) What the physician had found

to be useful; (*b*) What others had found useful; (*c*) And failing these, analogy.

The dogmatist was accused of recognizing no facts; the empiric of admitting no reasons. These two tendencies have remained in medicine. The humoral theory and the theory of the pneuma have disappeared, and a greater knowledge of specific therapy has crowded out the Empiric. The latter, however, had his day and did advance medicine along the lines of observation, semeiology, and materia medica.

Such is a brief account of the considerable and substantial advances made in mathematics, and the sciences including medicine, by the Alexandrian Schools. And now we must consider certain prevalent trends of philosophic thought which have left their traces on our modern world.

The philosophical speculation of the great Hellenic philosophers was carried on into the Hellenistic period, but the purer flights of the Greek intellect became infused with a mysticism and supernaturalism more congenial to the oriental mind. In the welter of beliefs that passed westward and constituted the matrix of religious thought in which Christianity founded much of its doctrinal formulae and ecclesiastical organization, one can discern the influence of the Stoics, the Epicureans and the Neoplatonists, and the persian cult of Mithraism. These systems influenced ethics or conduct. To Plato and his school, ethics and politics were two phases of one question. Good conduct was oftentimes the same as conduct good for the state. With the decay of the small Greek city state, ethics came to rely less on the unstable political conditions of a weakening "polis" and became a matter solely for the individual human being. This emphasis on individual ethics was in harmony with the origins of Christianity. It is difficult for the modern Christian theologian to adapt the individual ethics of his creed to an international programme, because his creed grew up in a settled Roman and peaceful world where international complications did not exist. As an individual ethic, it is a sublime precept to turn the other cheek. But can a statesman ask 30 million of his countrymen to do the same?

In Epicureanism and Stoicism, the human mind sought the same end—the freeing of the individual from the worries and uncertainties of life. Both implied acceptance of defeat. Stoicism founded by Zeno (336-264 B.C.) accepted the Socratic thesis that the good life depended primarily on knowledge. The Stoics advocated ascetic renunciation of the transient world, and justified a life based on reason, uncontrolled by the emotions, and in apathy to experience and environment. This alone brought serenity and wisdom. To a free personality they linked a materialistic determinism. Nature, God, and cosmic reason were the same and thus Pantheism was inevitable. Anything that happens is the will of God and calls for complete resignation. Stoicism implied a brotherhood of man—but only of those who were enlightened by stoic wisdom and virtue.

Epicureanism developed the primacy of individual self-interest. This philosophy had a greater moral elevation than merely a debased hedonism, as Epicurus taught that only those pleasures should be sought which were most enduring. Based on the philosophy of the mechanistic universe of Democritus, the supernatural influence of any form of divinity was excluded from the world. As after death, the atoms disintegrated, there was no immortality, therefore no fear of ultimate punishment. The Epicureans anticipated the utilitarian theory of

ethics of Jeremy Bentham—the greatest good to the greatest number—an ethical system of great influence in the 19th century. Thus the Epicurean who recognized that the greatest pleasure was good conduct approached at his highest level the more ascetic, ethical ideal of the Stoic, and Stoicism gave much of its thought and aspiration to early Christianity. It had its noblest pagan exemplification in the Roman Emperor, Marcus Aurelius.

Neither of these philosophies spread in the pagan world to the masses, who still held on to their main belief in animism, magic, and superstitious polytheistic beliefs. But the slaves, the unprivileged masses, as well as the intellectuals, all felt the current of skepticism abroad; and the decadence of the Greek world and the shadows of barbarism darkening the West, were a fertile medium for a positive faith which could give meaning and value to life. The ignorant thirsted for some justification of their misery, and the elite were ready to welcome a religion which gave hope and yet could be harmonized with the philosophy and rationalized ethics of the time. As the Western Roman Empire declined to its fall, and the decline began in the days of its apparently greatest power, Christian doctrine became a synthesis in fulfilment of this desire. Plato had believed in the immortality of his ideal world; that reality existed only in the universals—the ideal types laid up in heaven, of which the visible world is an imperfect copy; and, this view was developed by the Egyptian mystic Plotinus (204-270 A.D.) to the extreme position, the doctrine of Neo-Platonism, in which the world of sensation—the whole basis of material science—was ignored as unworthy of man's interest or thought. This extreme development of the metaphysical idealism of Plato, led to the view that absolute truth could be attained only through vision and ecstasy in a realm of experience where neither reason nor analytical observation had any part. From this rather than from Stoicism was Asceticism born. This philosophy of Neo-Platonism profoundly affected Christian thought for over a thousand years. While it prevented materialistic conceptions from dominating Christian theology, it no doubt contributed to the failure of the Dark Ages to carry on the advance of scientific study which had had its brilliant inception among the Greeks. The early Greek ideal had been to see life in all its aspects. The observer, while gazing into the infinite might keep his feet firmly planted on earth. The development of Neo-Platonism left philosophy in the clouds—not for a millenium did it return to the observation and analysis of the hard, stubborn facts of the material world.

Of the many oriental cults, the Persian religion of Mithraism left its imprint on the theology of the early Christian church. The believers in Mithras believed that Ormuzd, the Persian Sun God, led the forces of righteousness against Ahriman, the Persian devil, who had at his command a body of evil spirits; and, on the stage of the universe, these conflicting forces were in a perpetual duel to be ended only in a final cataclysm after which the forces of evil would be routed and Ormuzd would reign triumphant over a world of eternal bliss. Mithraism survived in early Christian belief and was the inspiration of the endless nightmares that tortured the souls of the orthodox of the mediaeval period.

Such were the more influential of the beliefs which were fostered by the Hellenistic world. These were passed on to the west by the rising power of Rome which by the end of the last century B.C. had become the dominant Mediterranean empire.

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NEWS AND NOTES

This is the first in a revived series of monthly features with which the JOURNAL hopes to keep University of Toronto medical undergraduates, faculty members, and alumni better posted on news and activities of mutual interest.

MEDICAL SOCIETY

Medical Society President Bob Hetherington has been elected President of the Students' Administrative Council of the University. This is the third time in four years that a Medsman has headed the University undergraduate organization. That this should be so, is a magnificent tribute to Bob's executive ability. As a general rule, the presidency is rotated among the different colleges represented on the Council.

* * *

Early indications are that this year's Medical Society will be one of the best ever. Events got off to a good start September 26 at the Women's Union, when Meds 5T5 were entertained at a highly successful Freshman Reception. Dean MacFarlane, Bob Hetherington, and Sid Wax brought greetings to the new medicos; and an address from Professor William Boyd was most enthusiastically received.

* * *

The Medical Society Executive has already announced some additions to, and some important changes in, its regular pattern of activity. On November 4, at Hart House, the Medical Society is introducing something new to the social life of the Campus. With "Panacea", the Medical Society plays host to this University, and to McGill (the McGill-Toronto football game is November 5). Besides providing entertainment for McGill and Varsity undergraduates, it is hoped that "Panacea" will help get inter-medical-school friendship down to a more personal level. Special invitations are being extended to the McGill medical undergraduates. Roy Rowsell and Dave Storey have organized their committee, and much preparation has already been made toward making the evening a really outstanding one. All of Hart House, from the swimming pool to the music room, is to be utilized.

* * *

Later in November, the Meds Soph-Frosh will be held. This is a change from the usual spring date. Bill Shaw and his committees are working hard to make this year's Soph-Frosh as effective as it will be different. The dance is to be a smaller, more congenial affair, designed to really acquaint the Soph and the Frosh.

The Meds At-Home, traditionally the highlight of the fall season, is this year being moved forward to February 15. Enthusiastic student backing in the past few years has enabled the committee to expand this year's dance considerably. Mart Kenny and his Western Gentlemen will be one of two orchestras in attendance. The floor space is to be increased to include the Royal York Crystal Ballroom as well as the Concert Hall.

* * *

Other Medical Society activity will be continuing much as usual. The Arts and Letters Club is soon to get its meetings underway. Daffydil Nite will be held this year December 12 to 15. A common-room renovating committee has been set up, and it is hoped that something can be done about the common-room at the Toronto General Hospital. CAMSI medical movies are to be resumed shortly.

CAMSI

The Camsi convention is being held this year October 20 to 23, at the University of Western Ontario. Peter Heaton will head the University of Toronto delegation in attendance. The delegation will be looking specifically for improvements in the Camsi Summer Employment Service, and in the Camsi Journal. The annual Medical Art Salon is being held in conjunction with the meetings.

* * *

The Camsi-sponsored, Canadian Interne Placement Service is being used this year for the first time on a national basis. Permanent headquarters are in Toronto. This year's Secretary-Treasurer is Fred Moffatt.

FACULTY

Recently, honours have been accorded popular and prominent members of the faculty. Professor R. I. Harris has been appointed an Honorary Fellow in the Royal College of Surgeons, England. Dr. Norman Shenstone delivered the inaugural Arthur Tudor Edward Lecture before the Royal College of Surgeons, England, this spring. Professor H. A. Cates has become the new Director of the School of Physical and Health Education. An honorary LL.D. from Dalhousie has been added to the impressive list of degrees belonging to Professor C. H. Best. Professor Emeritus Duncan Graham received an LL.D. from Queen's

University in spring convocation. Dean MacFarlane received an LL.D. from the University of Saskatchewan.

ALUMNI

The Medical Alumni Association is now preparing for a special course which is being held October 27 to 30, in conjunction with the All-Varsity Home-Coming Weekend. As a service to graduates, the Alumni Association has arranged for an extensive three day post-graduate course to be given October 27 to 29 at Sunnybrook Hospital. A post-graduate course was offered, on an experimental basis, last year and proved so successful that the Alumni have decided to institute comparable courses as yearly events. An attendance of upwards of 300 is anticipated. It will be an opportunity for alumni from all over Canada to meet again. Dr. O. L. Stanton of Yellowknife, N.W.T., who was honoured recently in an impressive civic ceremony for the medical service he has rendered his community, will be one of those travelling from distant points to attend.

As for the Home-Coming Weekend itself, extensive plans have been made by the Medical Alumni Association, the undergraduate Medical Society, and the various University committees. A Medical float will take part in the Saturday morning parade. Representative Medical acts will be included in the Blue and White Show in Convocation Hall, Saturday night. Sunday afternoon, between 4 and 6, the Medical Alumni are holding Open House in the Medical Building. Alumni, faculty members, and undergraduates are invited to attend.

* * *

The annual meeting of the University of Toronto Medical Alumni Association is scheduled for noon Friday, October 28.

* * *

This year the Medical Alumni Association has added two new scholarships to their ever-growing list of scholarships and bursaries available to University of Toronto Medical students. Full information is to be found in the 1949 Faculty of Medicine calendar.

R. L. SMITH

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1. Lapin, J. H.: J. Pediatrics 32:119 (February) 1948.
2. Hoffman, W. S.: J. Pediatrics 32:1 (January) 1948.

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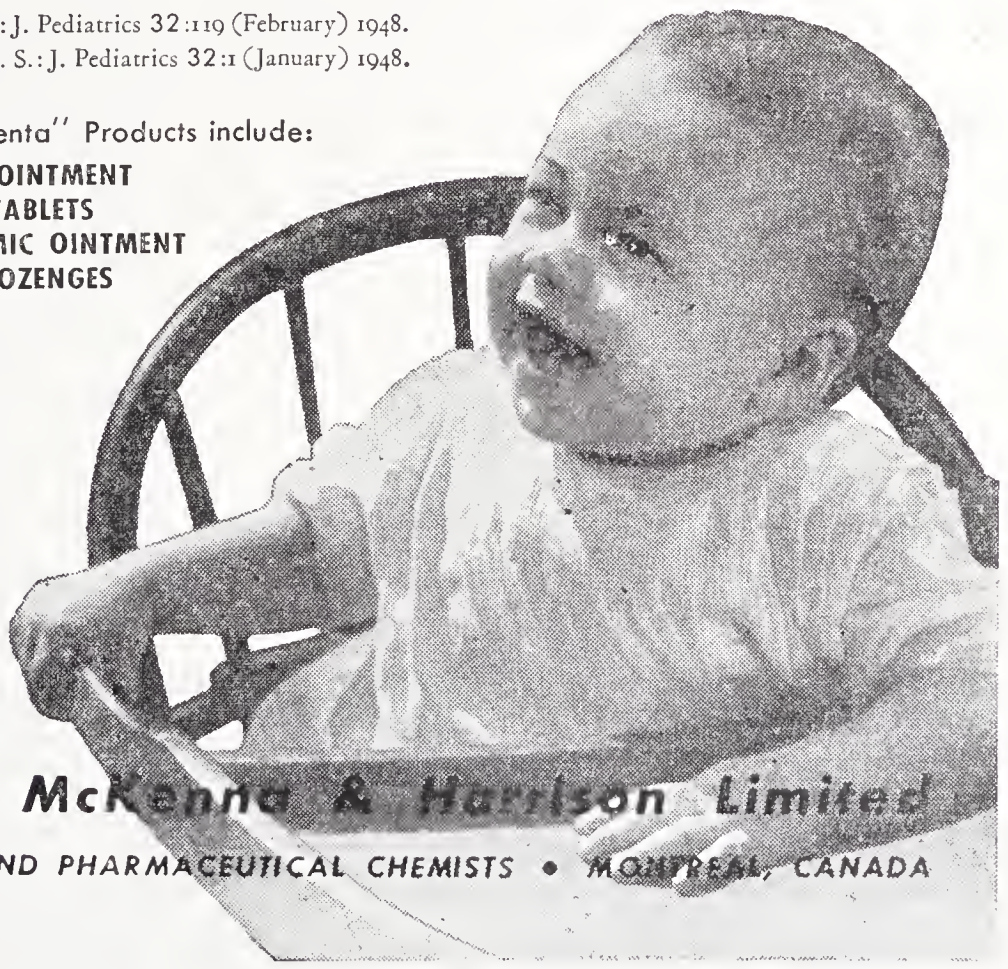

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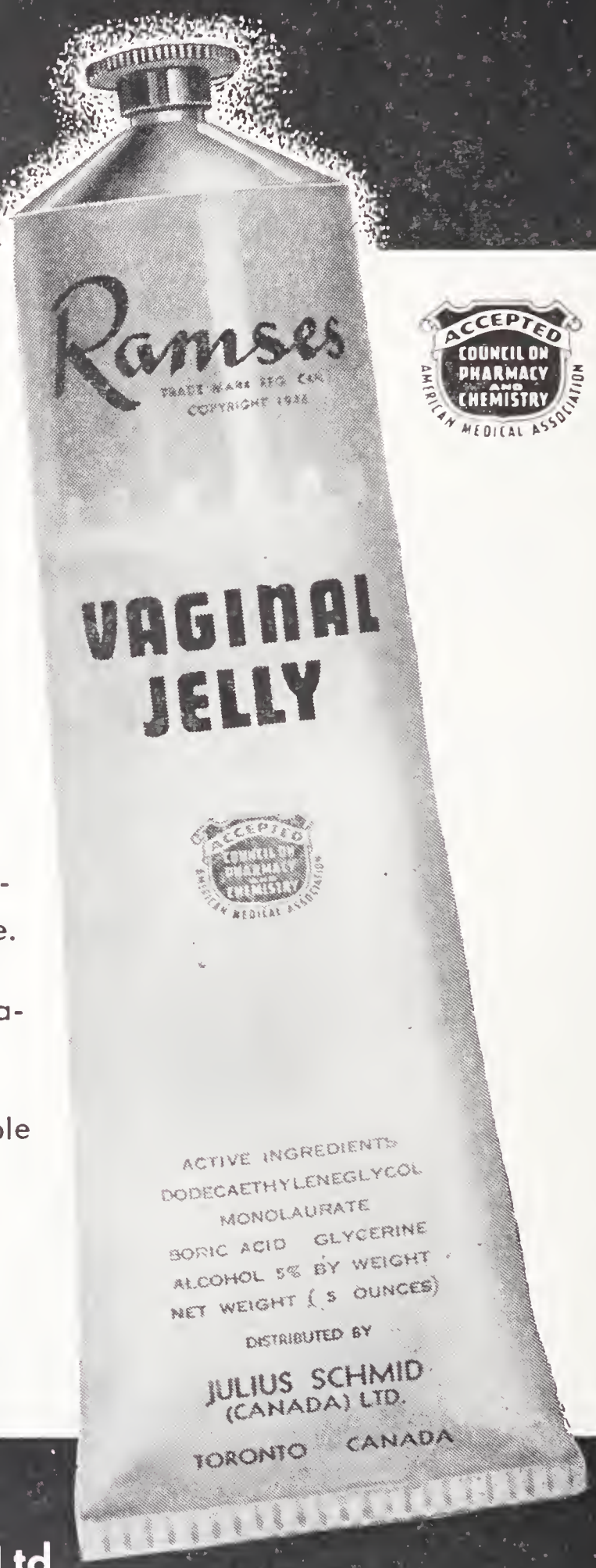

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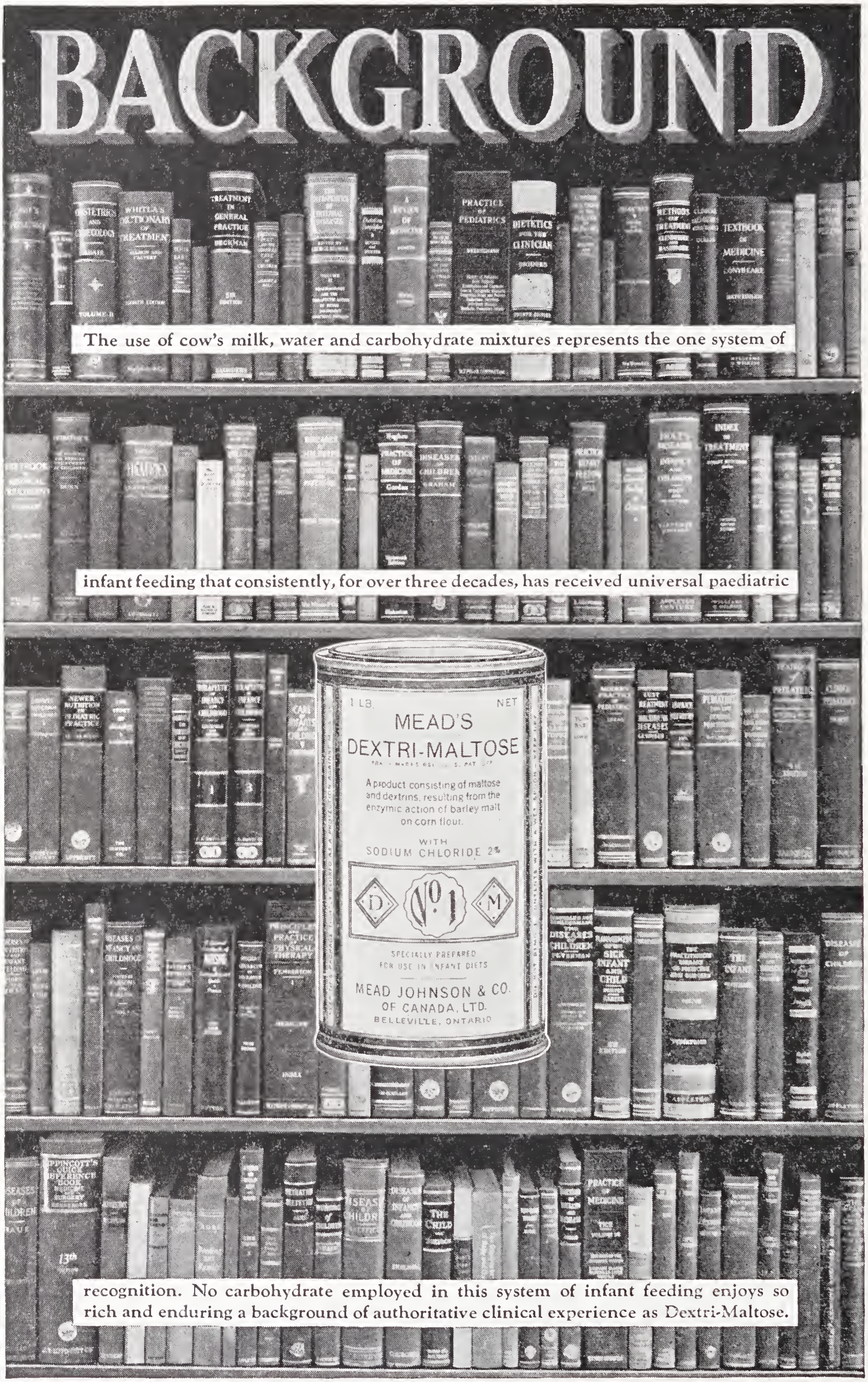

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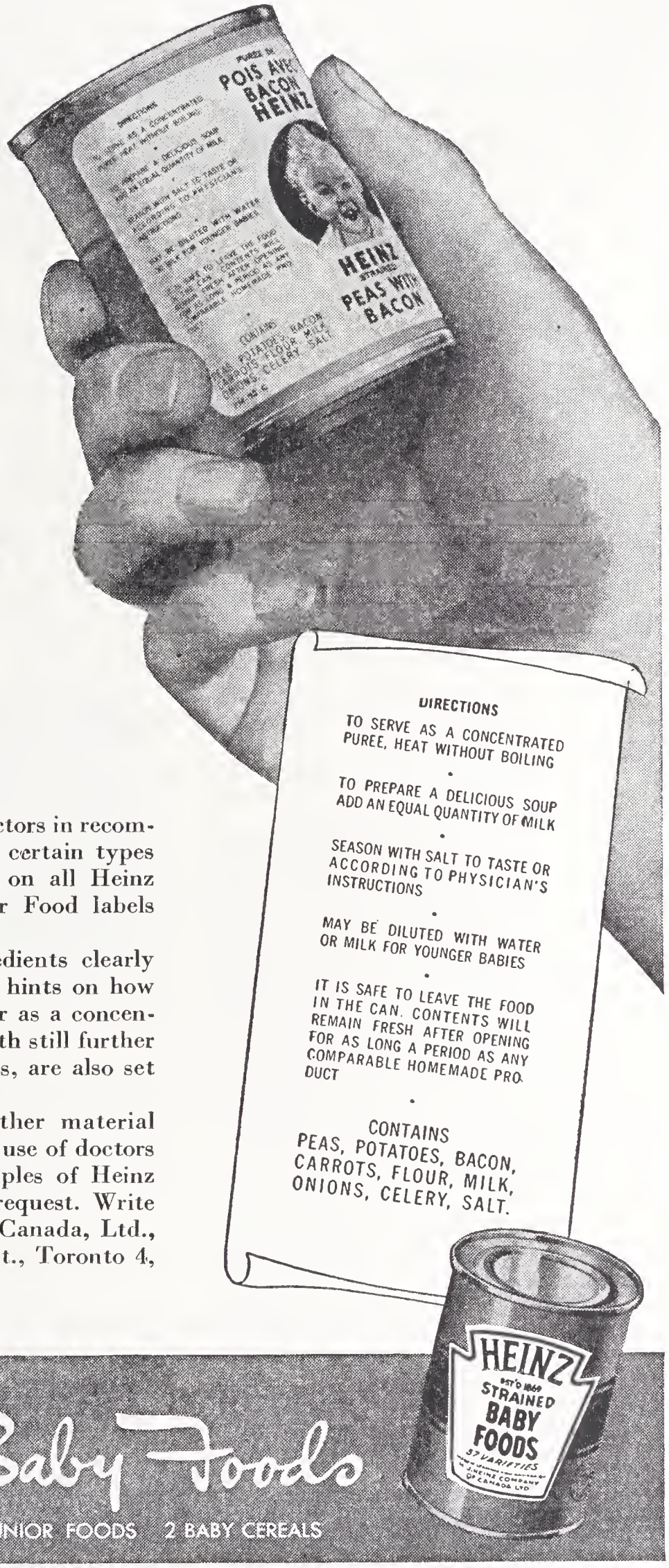
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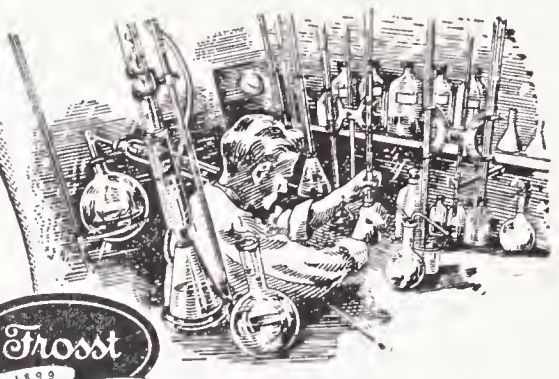

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